CITY OF FOREST PARK

CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

PROJECT NO.: 12012021

FOREST PARK - GILLEM
PUBLIC SAFETY BUILDING

FALCON DESIGN
*ENGINEERING * LAND PLANNING * SURVEYING *
*CONSTRUCTION MANAGEMENT * LANDSCAPE ARCHITECTURE*
WWW.FDC-LLC.COM

235 Corporate Center Drive., Suite 200, Stockbridge, GA 30281 / Phone: 770.389.8666

PRECISION Planning Inc.

400 Pike Boulevard, Lawrenceville, GA / Phone: 770.338.8181

TABLE OF CONTENTS

CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

FOREST PARK - GILLEM PUBLIC SAFETY BUILDING

PROJECT NO.: 12012021

PART 1 – BIDDING / AGREEMENTS / BONDS / CONDITIONS

VII. SUBCONTRACTOR AFFIDAVIT

VIII. FORM OF AGREEMENT

IX. NOTICE TO PROCEED

X. PERFORMANCE BOND

XI. PAYMENT BOND

XII. CERTIFICATE OF CONTRACTOR'S ATTORNEY

XIII. CERTIFICATE OF OWNER'S ATTORNEY

XIV. GENERAL CONDITIONS

XV. SUPPLEMENTARY CONDITIONS

XVI. GEOTECHNICAL TESTING REPORT

XVII. REFERENCE VERIFICATION AND RELEASE FORM

PART II – TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION TITLES PAGES

SECTION TITLES PAGES

SECTION TITLES PAGES

END

SECTION I

FOREST PARK - GILLEM PUBLIC SAFETY BUILDING

INVITATION TO BID

PROJECT NO.: 12012021

DATE: DECEMBER 1, 2021

Sealed unit price bids will be received by the City of Forest Park Georgia from prospective contractors for the City's "Gillem Public Safety Building" project. The work consists of furnishing and installing all materials, labor, tools, equipment, and related services required for a complete project. This project includes but is not limited to providing the site improvements and construction of a complete public safety facility on Anvil Block Road in accordance with the complete design plans and these Contract Documents and Technical Specifications.

The activity is proposed to be funded with local City of Forest Park funds. The selected contractor must comply with local and state laws including but not limited to provisions covering construction contracts.

Bidders must comply with the City of Forest Park's "Local, Small Business, Diversity Program". There is a participation goal for this project. The City wants to ensure that Bidders are non-discriminatory in their process of selecting sub-contractors. The City also wants to encourage Bidders to utilize local, veteran-owned, minority, women, and disadvantaged business enterprises whenever possible.

Complete sets of the Contract Documents, Technical Specifications and the Contract Drawings may be obtained from the Issuing Office from the City's preferred website: **https://www.forestparkga.gov/rfps**. Documents are also available at: **https://www.bidnetdirect.com/georgia/cityofforestpark** and at the Georgia Procurement Registry website located at: **https://ssl.doas.state.ga.us/PRSapp/PRindex.jsp**. Bidders are solely responsible for maintaining a complete set of Contract Documents, Technical Specifications, Contract Drawings, and project Addenda or Modifications to assure that they

possess all project changes and addendums prior to bidding. **Any project Addenda or modifications will be available only on the City's preferred website.**

A **Mandatory Pre-Bid Conference** will be held on **Thursday, December 16, 2021 @ 11:00 AM EST** at the City of Forest Park City Hall, City Council Meeting Room located at 745 Forest Parkway, Forest Park GA, 30297. A site tour is scheduled immediately following the Pre-Bid Conference.

Any questions pertaining to the requirements of the Contract Documents and Technical Specifications, either procedural or technical, shall be in writing and are to be submitted to the City of Forest Park; Attention: A. Girard Geeter - Procurement Manager, via email at **ageeter@forestparkga.gov** by **5:00 PM on Tuesday, January 11, 2022**, Reference: **"Forest Park - Gillem Public Safety Building"**. Sealed Bids will be received by the City of Forest Park at Forest Park City Hall, City Council Meeting Room located at 745 Forest Parkway, Forest Park GA, 30297 until **2:00 PM EST on Tuesday, January 18, 2022** and then publicly opened and read aloud.

No bid may be modified, withdrawn, or canceled for a period of sixty (60) days after the time designated for the receipt of Bids or until the Bidder is notified by the City; whichever is sooner. The City reserves the right to accept or reject any and all bids and to waive irregularities, technicalities, and formalities.

Each bid shall be accompanied by a Bid Bond in an amount of not less than five percent (5%) of the total bid amount. The Bid Bond may be in the form of a bond issued by a surety acceptable to the City or a cashier's check made payable to the City of Forest Park, Georgia. The entire Bid Bond shall be forfeited to the City of Forest Park as liquidated damages if the bidder fails to execute the Contract and provide Performance and Payment Bonds within fifteen (15) days after being notified that he has been awarded the Contract.

The successful bidder will be required to furnish a contract Performance Bond and a Payment Bond, each in the sum of one hundred percent (100%) of the total amount of the Bid and provide insurance coverage as required in the Contract Documents.

Note: For more information, please refer to the Instruction to Bidders and the Contract Documents, which govern and supersede this Invitation to Bid.

SECTION II

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

SECTION II

ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Owner* - City of Forest Park, Georgia

B. *Issuing Office (City of Forest Park)* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

C. *Contract Bid Number* – The official number associated with the contract bid as determined by the date of release for the official bid by the City of Forest Park.

D. *Plan Holders List* – All Bidders must attend the Mandatory Prebid Conference to be included on the Plan Holders List. The City of Forest Park will maintain the official Plan Holders List for this project. Bids received from Bidders not listed on the Plan Holders List will not be accepted.

E. *Owner's Representative* – Falcon Design Consultants, LLC, an independent consulting engineering firm, is the City of Forest Park's appointed Owner's Representative for this project.

F. *Design Architect* – Precision Planning, Inc., an independent architectural design firm, is the design Architect of record for this project.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 **A.** Complete sets of the Bidding Documents in the number and for the amount stated in the Advertisement or Invitation to Bid are to be obtained from the Issuing Office. The Issuing Office will maintain the official Plan Holders List for this project

B. Complete sets of the Contract Documents, Technical Specifications and the Contract Drawings may be obtained from the Issuing Office from the City's preferred website: **https://www.forestparkga.gov/rfps**. Documents are also available at: **https://www.bidnetdirect.com/georgia/cityofforestpark** and at the Georgia Procurement Registry website located at: **https://ssl.doas.state.ga.us/PRSapp/PRindex.jsp**.

C. Bidders are solely responsible for maintaining a complete set of Contract Documents, Technical Specifications, Contract Drawings, and project Addenda or Modifications to assure that they possess all project changes and addendums prior to bidding.

D. All bid documents will be posted online at the sites shown in Article 2.01 – Paragraph B.

SECTION II

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit written evidence with bid such as financial data, previous experience, present commitments, and such other data as may be called for below.

A. Required Bidder Qualification Statement with Supporting Data (Business License, Corporate Resolution to Bid, Financial Statement, Current Workload, etc.)

B. Required Bidder current Georgia General Contractors License

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Subsurface and Physical Conditions*

A. The Supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site, including but limited to a geotechnical report.

2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. Copies of reports and drawings, if any, referenced in Paragraph 4.01.A will be made available by Owner to any Bidder upon written request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 *Hazardous Environmental Condition*

A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.

B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions. On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.05 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;

E. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

F. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

G. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

H. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work; and

I. refer to the submittal checklist and submit bid documents in the order according to the submittal checklist.

4.06 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – MANDATORY PRE-BID CONFERENCE

5.01 A **MANDATORY PRE-BID CONFERENCE** will be held at **11:00 AM EST on Thursday, December 16, 2021** at the City of Forest Park City Hall, City Council Meeting Room located at 745 Forest Parkway, Forest Park GA, 30297. A site tour is scheduled immediately following the Pre-Bid Conference. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend and participate in the conference since this meeting is mandatory. Engineer will transmit to all prospective Bidders such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

SECTION II

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions pertaining to the requirements of the Contract Documents and Technical Specifications, either procedural or technical, shall be in writing and are to be submitted to the City of Forest Park; Attention: **A. Girard Geeter** via email to the Procurement Department at **ageeter@forestparkga.gov**. Interpretations or clarifications considered necessary by the City in response to such questions will be issued by Addenda to all parties recorded by Issuing Office on the Plan Holders List as having attended the Mandatory Prebid Conference. Questions received after **5:00 PM on Tuesday, January 11, 2022** may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer and all Addenda will be transmitted to all bidders listed on the Plan Holders List.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of consecutive calendar days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

SECTION II

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitutes or "or-equal" materials and equipment approved by Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or "or-equal" unless written request for approval has been submitted by Bidder and has been received by Engineer at least 10 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 – LOCAL, SMALL BUSINESS, DIVERSITY PROGRAM

13.01 The City of Forest Park has implemented a Local, Small Business, Diversity Program to

promote full and open competition in all city contracts. LSBD participation goals are set on a contract-by-contract basis for each specific prime contract with subcontracting possibilities. The City wants to ensure that Proponents are non-discriminatory in their process of selecting sub-contractors. The City also wants to encourage Proponents to utilize local, veteran-owned, minority, women, and disadvantaged business enterprises whenever possible.

Included in this RFQB are subcontracting/subconsultant forms that all Bidders will be required to complete along with their Bids (in addition to general contractor forms). All forms included in this solicitation must be completed for Bidder to be considered responsive.

Each Bidder must propose to achieve the LSBD participation goal that is equal or greater than the percentage required. Each Bidder will be required to submit evidence demonstrating that "good faith efforts" were made if you cannot meet the goal.

These forms are requirements under the City of Forest Park's Local, Small Business, Diversity Program, and it is a requirement to comply with making the "good faith effort" to achieve the goal. Failure to complete these forms will deem you non- responsive.

The participation goal for this procurement is 25 percent (25%)

A business is considered Local if they meet the following:

1. The business or supplier must operate and maintain a regular place of business within the geographical boundaries of the city;

2. The business or supplier must provide a copy of a current occupational tax certificate;

3. The business or supplier must have paid all real and personal taxes (if any) owed the city and not otherwise owe the city any funds; and

4. The business or supplier must certify its compliance with the Georgia Security and Immigration Act.

A Small Business means a locally based business whose average annual gross receipts or number of employees averaged over the past five years must not exceed the size standards as defined pursuant to 15 C.F.R § 121.201 et al., who demonstrates that individual owner's personal net worth and does not exceed $750,000.00, exclusive of the individual's ownership interest in their primary residence and the value of the LSBD.

13.02 LSBD Required Forms –

To be submitted with Bid:

1. LSBD-1 Covenant of Non-Discrimination: The signed agreement stating that the firm will not discriminate on the basis of a firm's size (revenue or employee count) with regard to prime contracting, subcontracting, or partnering opportunities.

2. LSBD-2 Sub-Contractor Contact Form: A list of all firms contacted to participate as LSBD sub-contractors/suppliers on a contract.

3. LSBD-3 LSBD Sub-Contractor/Supplier Utilization Form: A list of all firms procured as LSBD sub-contractors/suppliers to be utilized on a contract.

4. LSBD-4 Statement of Good Faith Efforts (Including the Checklist): Documented efforts to seek and procure the utilization of LSBD's as sub-contractors/suppliers on a contract where a goal is required.

To be submitted post-award:

5. LSBE-5 Post Award Monthly LSBD Participation Report – Contract Goal: Report detailing percentage of LSBD participation (work performed) and payments to VOB/MBE/WBE/DBE subcontractors on a monthly basis.

6. LSBD-6 Request for Subcontractor Removal/Substitution Form: Required to fill out and obtain approval if a LSBD subcontractor is being substituted following post bid.

13.03 Supplements

1. Form LSBD-1, Covenant of Non-Discrimination
2. Form LSBD-2, Sub-Contractor Contact Form – Contract Goal
3. Form LSBD-3, Local, Small Business, Diversity Project Participation Plan
4. Form LSBD-4, Statement of Good Faith Efforts
5. Form LSBD-5, Post-Award-Monthly LSBD Participation Report Contract Goal
6. Form LSBD-6, Subcontractor Removal/Substitution Form

SECTION II

FORM LSBD-1

COVENANT OF NON-DISCRIMINATION

The undersigned understands that it is the policy of the City of Forest Park (COFP) to promote full and equal business opportunity for all persons doing business with the City. The undersigned covenants that we have not discriminated on the basis of a firm's revenue, employee count, social or economic disadvantages, minority, gender, or veteran status, with regard to prime contracting, subcontracting or partnering opportunities. The undersigned further covenants that we have completed truthfully and fully the required forms LSBD-2, LSBD-3 and LSBD-4. Set forth below is the signature of an officer of the Bid entity with the City of Forest Park to bind the entity.

I, _____(Name, Title), on behalf of _____ (Company), by my signature below, do hereby promise:

1. To adopt the policies of the City of Forest Park relating to equal opportunity in contracting on projects and contracts funded, in whole or in part, with funds of COFP;
2. Not to otherwise engage in discriminatory conduct; To provide a discrimination-free working environment;
3. That this Covenant of Non-Discrimination shall be continuing in nature and shall remain in full force and effect without interruption; and
4. That this Covenant of Non-Discrimination shall be incorporated by reference into any contract or portion thereof which we may hereafter obtain.

We understand that our failure to satisfactorily discharge any of the promises of non-discrimination as made and set forth herein shall constitute a material breach of contract.

By:_____

Title:_____

Sworn to and subscribed before me the_____day of_____,
_____.

Notary Public:_____

My Commission Expires:_____

[SEAL]

SECTION II

FORM LSBD-2

SUB-CONTRACTOR CONTACT FORM – CONTRACT GOALS

Instructions to Contractors

The prime contractor must complete and sign the sub-contractor **contact form** and submit the completed and signed form with the bid. **Failure to submit this form will result in being deemed nonresponsive.**

1. Name of contractor/supplier: Provide name of the contractor or supplier you contacted to perform on the project.

2. Contact Name, Address and Phone Number: Provide the contact information of the contractor/supplier you contacted.

3. City of Forest Park Business License: State if the contractor/supplier you contacted is a City of Forest Park Licensed business.

4. Type or work solicited for: Describe the type of work for which you are soliciting from the contractor/supplier.

5. Business Ownership (Enter Code): State whether the contractor/supplier you contacted is an MBE – Minority Business Enterprise, DBE – Disadvantaged Business Enterprise, WBE – Women Business Enterprise, or VOB – Veteran Owned Business (if applicable)

6. Results of Contact: Describe the results of your contact.

7. Sign and date the form.

SECTION II

FORM LSBD-2

CITY OF FOREST PARK
SUBCONTRACTOR CONTACT FORM

List all subcontractors or suppliers *(LSBE and Non-LSBD)* that were **contacted** regarding this project

Name of Sub-Contractor/Supplier	Company Name, Address, Email, and Phone Number	City of Forest Park Business License? (Yes or No)	Type of Work Solicited For	Business Ownership (Enter Code)	Results of Contact
John Smith	Company ABC 123 Main Street Morrow, GA 30260 jsmith@email.com 770-123-4698	Yes	Hauling	DBE	Will perform as sub

Diversity Code: MBE – Minority Business Enterprise, DBE – Disadvantaged Business Enterprise, WBE – Women Business Enterprise, VOB – Veteran Owned Business

Sample

SECTION II

FORM LSBD-2

CITY OF FOREST PARK

SUBCONTRACTOR CONTACT FORM

List all subcontractors or suppliers *(LSBE and Non-LSBD)* that were **contacted** regarding this project

Name of Sub-Contractor/Supplier	Company Name, Address, and Phone Number	City of Forest Park Business License? (Yes or No)	Type of Work Solicited For	Business Ownership (Enter Code)	Results of Contact

Diversity Code: MBE – Minority Business Enterprise, DBE – Disadvantaged Business Enterprise, WBE – Women Business Enterprise, VOB – Veteran Owned Business

Local, Small Business, Diversity Form (Page 1 of 2)

SECTION II

FORM LSBD-2

SUB-CONTRACTOR CONTACT FORM – Cont'd

List all sub-contractors or suppliers (LSBD and Non-LSBD) that were contacted regarding this project

Name of Sub-Contractor/Supplier	Company Name, Address, Email, and Phone Number	City of Forest Park Business License? (Yes or No)	Type of Work Solicited For	Business Ownership (Enter Code)	Results of Contact

Bidder's Name: _____ **Project Name:** _____ **FC#:** _____

Signature: _____ **Contact No:** _____ **Date:** _____

Local, Small Business, Diversity Form (Page 2 of 2)

SECTION II

FORM LSBD-3

LOCAL, SMALL BUSINESS, DIVERSITY OPPORTUNITY SUBCONTRACTOR PROJECT PLAN

SUBCONTRACTOR/SUPPLIER UTILIZATION

Instructions to Contractors

The Bidder must complete the project participation plan for sub-contractor/supplier utilization and **submit the form with the Bid**. **Failure to submit this form will result in a Bid being deemed "nonresponsive".** Each project participation plan for sub-contractor/supplier must include the following:

1. Name of subcontractor/supplier: Provide name of the subcontractor or supplier contacted to perform work on the project.

2. Contact Name, Address & Phone Number: Provide contact information of the subcontractor/supplier contacted.

3. City of Forest Park Business License: State if the subcontractor/supplier contacted is a City of Forest Park licensed business.

4. Type or Scope of Work to be Performed: Describe the type or scope of work subcontractor/supplier will perform.

5. Certification of Business Owner: Provide minority code/classification (if applicable). Examples include, but not limited to: Minority Business Enterprise (MBE), Disadvantaged Business Enterprise (DBE), Women Business Enterprise (WBE), Veteran Owned Business (VOB), etc.

6. Estimated Dollar Value of Work: Provide an estimated dollar value for the work to be performed by subcontractor/supplier within the project scope.

7. Percentage of Total Bid Amount: Provide an estimated percentage of the total Bid amount that will be paid to the subcontractor/supplier.

8. Signature of Bidder: All LSBD Participation Plans must be signed and dated by Bidders.

Estimated Dollar Value of the Work / Total Bid Amount = % of Total Bid Amount

SECTION II

FORM LSBD-3

CITY OF FOREST PARK LOCAL, SMALL BUSINESS, DIVERSITY OPPORTUNITY SUBCONTRACTOR PROJECT PLAN SUBCONTRACTOR/SUPPLIER UTILIZATION

List all subcontractors/suppliers, including lower tiers, **to be used** on this project.

Name of Sub-Contractor/Supplier	Company Name, Address, Email, and Phone Number	City of Forest Park Business License? (Yes or no)	Type of Work to be Performed	Owner of Business (See code below)	Dollar ($) Value of Work	Percentage of Total Bid Amount
John Smith	Company ABC 123 Main Street Forest Park, GA 30297 jsmith@email.com 770-123-4698	Yes	Hauling	DBE	$4200	8.4%

Total Local Business, % _____ Total Small Business % _____ Total Minority Business % _____

Diversity Code: MBE – Minority Business Enterprise, DBE – Disadvantaged Business Enterprise, WBE – Women Business Enterprise, VOB – Veteran Owned Business

Proponent's Company Name: _____ Date: _____ FC#: _____

Proponent's Contact Number: _____ Project Name: _____

Signature: _____ _____

Sample

SECTION II

FORM LSBD-3

CITY OF FOREST PARK LOCAL, SMALL BUSINESS, DIVERSITY OPPORTUNITY SUBCONTRACTOR PROJECT PLAN SUBCONTRACTOR/SUPPLIER UTILIZATION

List all subcontractors/suppliers, including lower tiers, **to be used** on this project.

Name of Sub-Contractor/Supplier	Company Name, Address, Email, and Phone Number	City of Forest Park Business License? (Yes or no)	Type of Work to be Performed	Owner of Business (See code below)	Dollar ($) Value of Work	Percentage of Total Bid Amount

Total Local Business, % _____ Total Small Business % _____ Total Minority Business % _____

Diversity Code: MBE – Minority Business Enterprise, DBE – Disadvantaged Business Enterprise, WBE – Women Business Enterprise, VOB – Veteran Owned Business

Proponent's Company Name: _____ Date: _____ FC#: _____

Proponent's Contact Number: _____ Project Name: _____

Signature: _____ _____

SECTION II

FORM LSBD-4

STATEMENT OF GOOD FAITH EFFORTS

Instructions:

If you will not meet the Local Small Business Diversity (LSBD) goal set forth in the RFQB, in addition to the information included on the LSBD Form 2 Sub-contractors Contact Form submitted with your bid, please provide a narrative explanation of why you cannot meet the LSBD goal and the steps taken to include LSBDs in your bid. Describe specific actions (i.e. phone calls, etc.). Please provide copies of any solicitation notices sent, whether by email, fax or mail, and the amount of time given for response. Describe efforts to follow up initial communications. Identify the individuals from your organization who performed these activities. Attach additional pages as needed.

CERTIFICATION OF GOOD FAITH EFFORTS

I hereby attest that I have exercised good faith efforts to meet the Local Small Business Diversity goal for this bid. Despite such good faith efforts, I have not been able to meet the LSBD goal for this bid.

_____
(Name of Organization)

_____ _____
(Print Name) (Title)

_____ _____
(Signature) (Date)

SECTION II

FORM LSBD-4 (Cont'd)
STATEMENT OF GOOD FAITH EFFORTS
Checklist

All Bidders are required to demonstrate that they have made "good faith efforts" and provide proof to meet COFP's LSBD participation goal. Please indicate whether or not any of the following actions were taken:

	Yes	No	
1.	❑	❑	Attendance at a pre-bid meeting, if any, scheduled by COFP to inform LSBDs of subcontracting opportunities under a given solicitation; Advertisement for solicitation of LSBDs in general circulation media, trade association publications, and minority- focus media, to provide notice of subcontracting opportunities.
2.	❑	❑	Advertisement in general circulation media at least seven (7) days prior to Bid or Bid opening any and all Sub-contractor opportunities. Proof of advertisement must be submitted with the Bid or Bid.
3.	❑	❑	Provided interested LSBDs with timely, adequate information about the plans specifications, and other such requirements of the Contract to facilitate their quotation and conducted follow up to initial solicitations.
4.	❑	❑	Provided written notice to LSBDs that their interest in subcontracting opportunities or furnishing supplies is solicited. Provided a contact log showing the name, address, email and contact number (phone or fax) used to contact the proposed certified sub- contractors, nature of work requested for quote, date of contact, the name and title ofthe person making the effort, and the amount of the quoted price if one was obtained.
5.	❑	❑	Efforts were made to divide the work for LSBD subcontracting in areas likely to be successful and identify portions of work available to LSBDs consistent with their availability. Include a list of divisions of work not subcontracted and the corresponding reasons for not including them. The ability or desire of a Bidder/Bidder to perform thework of a contract with its own organization does not relieve it of the responsibility to make good faith efforts on all scopes of work subject to subcontracting.
6.	❑	❑	Efforts were made to assist potential LSBD sub-contractors to meet bonding, insurance or other governmental contracting requirements. Where feasible, facilitatingthe leasing of supplies or equipment when they are of such a specialized nature that an LSBD could not readily and economically obtain them in the marketplace.
7.	❑	❑	Utilization of services of available minority community organizations, minority contractor groups and other organizations that provide assistance in the recruitment and placement of LSBDs.
8.	❑	❑	Communication with the COFP Procurement Department seeking assistance in identifying available LSBDs.
9.	❑	❑	Exploration of joint venture opportunities with LSBDs.
10.	❑	❑	Other actions (specify):

Please explain any "no" answers listed above (by number):

This list is a guideline and by no means exhaustive. The City of Forest Park will review these efforts, along with other documents, towards assessing the Bidder/Bidder's efforts to meet COFP's LSBD goal. If you require assistance in identifying certified LSBDs, please contact the Procurement Department at ageeter@forestparkga.gov or at 404-366-4720.

SECTION II

FORM LSBD-5

POST AWARD MONTHLY LSBD PARTICIPATION REPORT – CONTRACT GOAL

Instructions to Contractors

The prime contractor must complete the **participation report** and submit the form with each pay application to the COFP Department Project Manager in charge of the contract. **Failure to submit this form will result in payment application being deemed incomplete.**

1. Report Number: Reports must be consecutively numbered. It will only be necessary to submit a report in a period when the approved VOB/MBE/WBE/DBE has performed a portion of the work that has been designated for the contract.

2. Date: Actual date of the report.

3. Pay application period end date: Reports must acknowledge the end date for the period for which is being reported.

4. VOB/MBE/WBE/DBE Amount: The amount of the contract for which the VOB/MBE/WBE/DBE will earn.

5. Prior Earned Pay Application Amount: The amount previously submitted for payment on pay application.

6. Current Earned Pay Application Amount: The amount submitting with current payment application.

7. Earnings To-Date: The actual amount that each VOB/MBE/WBE/DBE has earned to-date under the contract.

8. Percent of Contract: This percentage is calculated using the contract amount and the total VOB/MBE/WBE/DBE earnings-to-date. Divide the total contract amount by the total VOB/MBE/WBE/DBE earnings-to-date.

9. Certification: The contractor's authorized representative must sign this form prior to submittal.

GENERAL INFORMATION

When the approved VOB/MBE/WBE/DBE is to provide materials, goods or services, this completed form must be submitted to the COFP Department Project Manager. The prime contractor must notify COFP of any changes to VOB/MBE/WBE/DBE firms.

When the prime contractor is an approved LSBD, it will only be necessary to complete the total LSBD earnings to-date. Joint ventures between non-LSBD and certified LSBD: Only that portion of the work for which the LSBD is responsible may be used to satisfy the requirement.

It is not necessary to complete this form if there are no subcontracting opportunities available for the use of VOB/MBE/WBE/DBE firms.

SECTION II

FORM LSBD-5

POST AWARD – LSBD PARTICIPATION REPORT – CONTRACT GOAL

PROJECT NO. (S): _____

REPORT NO.: _____

CONTRACTOR: _____

DATE: _____

CONTRACT AMOUNT: $_____

PAY APPLICATION PERIOD END DATE: _____

Check if final payment >>> ❍ FINAL PAYMENT

% LSBD GOAL_____

VOB/MBE/WBE/DBE AMOUNT $: _____

NAME OF APPROVED VOB/MBE/WBE/DBE	DESCRIPTION OF WORK	PRIOR EARNED PAY APPLICATION AMOUNT	CURRENT EARNED PAY APPLICATION AMOUNT	EARNINGS TO-DATE

TOTAL VOB/MBE/WBE/DBE EARNINGS TO-DATE: _____

% CONTRACT: _____

I HEREBY CERTIFY THAT THE ABOVE STATEMENT IS TRUE AND CORRECT AND SUPPORTING DOCUMENTATION IS ON FILE AND IS AVAILABLE FOR INSPECTION BY COFP AT ANY TIME.

SIGNED_____
CONTRACTOR

REMARKS_____

_____

FOR DEPARTMENT USE ONLY:

THIS DOCUMENT HAS BEEN REVIEWED AT THAT PROJECT LEVEL BY:

SIGNED_____ TITLE _____

THIS DOCUMENT HAS BEEN REVIEWED AT THE PROGRAM LEVEL BY:

SIGNED_____TITLE_____

SECTION II

FORM LSBD-6

Request for Subcontractor Removal/Substitution

Prior to submitting this form to the Procurement Department you must notify the LSBD in writing of your intent and allow the LSBD five (5) days to respond.

Request Date:		Contract/Project #:
Contract Value:	LSBD Contract Amount:	Amount Paid to LSBD:
Prime Contractor Name:		
Prime Contractor Address:		
Prime Contact Name:	Prime Contact Email:	Prime Contact Phone:
Name of LSBD Firm:		LSBD Contact Name:
LSBD Firm Address:	LSBD Email:	LSBD Phone:

Was LSBD firm given five (5) days written notice of intent? ☐ Yes or ☐ No If yes, please attach written notice.
Will the LSBD goal for the project still be met? ☐ Yes or ☐ No or ☐ N/A

Reason(s) for removal/substitution. **Check all that apply**

☐ **The listed LSBD** is no longer in business.

☐ **The listed LSBD** requested removal.

☐ **The listed LSBD** failed or refused to perform under the terms of the contract or failed to furnish the listed materials.

☐ The work performed by **the listed LSBD** was unsatisfactory and was not in accordance with the scheduled specifications.

Name/Address of Substitution Contractor:	Is the substituted contractor an LSBD? ☐ Yes or ☐ No
Fully describe the type of work the substitute subcontractor will perform:	

Prime Authorized Signature:	**Date:**
Approved ☐ Rejected ☐	**Reason for rejection:**
Procurement Manager Authorized Signature:	**Date:**

This form should be completed and submitted (with all required documentation) to:

City of Forest
Attention: Arthur Greeter
745 Forest Parkway
Forest Park GA, 30297

ARTICLE 14 – PREPARATION OF BID

14.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from Engineer.

14.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section listed therein.

14.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

14.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

14.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

14.06 A Bid by an individual shall show the Bidder's name and official address.

14.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

14.08 All names shall be printed in ink below the signatures**.**

14.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form in addition to submitting the Acknowledgement of Addenda Form 11.

14.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

14.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 15 – BASIS OF BID; COMPARISON OF BIDS

15.01 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The value of items required by the Contract Documents but not show in the line items on the Bid Form shall be included in the unit price of the line item that relates to this work.

C. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

D. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

15.02 *Allowances*

A. Bidder is to include a "**Construction Contingency Allowance**" amount equal to five percent (5%) of the "**Lump Sum Base Bid Amount**" within the "**Lump Sum Base Bid**" the amount bid on the Bid Form submitted. This allowance is for additional work as directed by the Owner. Monies not utilized by the Owner for this project will be removed from the final contract price at the completion of the project by use of a Change Order.

ARTICLE 16 – SUBMITTAL OF BID

16.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the following documents. Please refer to the submittal checklist to track the preparation and order of submittal of certain required information with the Bid.:

A. Required Bid security;

B. LSBD Forms 1-4 ;

C. List of 5 Project References;

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

E. Copy of Contractor's License *[or]* Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain the following said license within the time for acceptance of Bids.

1. Georgia's General Contractor License(s),

F. Certificate of Insurance (listing Forest Park as the Certificate Holder);

G. Contractor Affidavit and Agreement;

H. Subcontractor Affidavit;

I. Contractor's Statement of Legal Status and Financial Capability;

J. Certification Regarding Debarment, Suspension, and Other Matters;

K. Non-Collusion Affidavit;

L. Bidder's Contact Directory;

M. Acknowledgment of Addenda;

N. Required Bidder Qualification Statement with Supporting Data for the following:

1. Organizational Structure/Key Personnel and Resumes: The Bidder's Organizational Structure Section should introduce the proposed Bidder team by:

   1.1. Provide the Bidder's Management Organizational Chart both graphically and in narrative format. The Organizational chart and narrative should provide a description of the Bidder's views on how it will organizationally provide the Services.

   1.2. Provide a description of how the organizational structure will facilitate managing the Services requested and how an efficient flow of information will be realized from the organizational structure.

   1.3. Provide resumes for key personnel you intend to assign to this Project for the following positions: Principal-in-charge, Project Manager and On-Site/Quality Assurance Supervisor. Submission of these names constitutes a commitment to use these individuals if the Bidder is awarded a Contract, and changes may be made only with the prior written consent of the City.

      1.3.1. Resumes should be organized as follows:
      1.3.2. Name and Title;
      1.3.3. Professional Background;
      1.3.4. Current and Past Relevant Employment;
      1.3.5. Education; and
      1.3.6. Certifications.

2. Overall Project Experience, Qualifications, and Performance on Previous Similar Projects

   2.1. Describe the Bidder company's history of experience providing general contracting services for a city or commercial property of similar size and scope including but not limited to fire stations or other government buildings, major shopping malls, office parks, major office complexes, hotels or convention facilities, government buildings, facilities or complexes, or major colleges/universities.

   2.2. Provide detail evidence that is currently providing general contracting services.

2.3. Provide the number of years responder has operated under current company name?

2.4. Provide a matrix of five (5) relevant projects within the last ten (10) years of similar size and scope, including client name, project description, project value, role of the individual, project completion date, reference contact name, phone number and e-mail address. Refer to Section XVII- Form 5

3. Management and Staffing Plan

3.1. Describe how the project will be organized and managed, ensuring that staffing needs are met for the delivery of services and duties as outlined in Exhibit A. Clearly outline the estimated staffing for each service area.

3.2. Describe your processes, procedures and methodology for monitoring quality control and required outcome for services being provided. The plan should include the name and title of the inspector, frequency of each inspection, and all forms that will be used to document the inspections.

3.3. Describe your process for reporting capabilities and provide sample reports for this project, i.e., performance measures, quality of work, and deliverables.

3.4. Provide a list of resources and include a list of equipment with quantity of each.

4. Quality Control Plan Approach

4.1. Bidder must submit an executive level plan describing the management process the Bidder will implement to ensure all work and services performed are of the highest quality. The approach should include a description of the Bidder's process as it pertains to shop drawings, product and materials submittals, inspection of subcontractor/subconsultant work and materials, means and methods of conducting Quality Control testing, etc. Describe the Bidder's corrective action plan. Describe how the Bidder's organizational structure supports this plan and clearly identify responsible and accountable parties (Do not provide the Bidder's existing Quality Control Manual).

5. Procurement Plan

5.1. Bidder must submit an executive level approach (3 pages maximum) to the competitive and open procurement of subcontractors/subconsultants, materials, supplies and equipment required to complete a project. The plan must address the bonding requirements it will require of the subcontractors as well as any bonding assistance available to subcontractors. Include your ability to purchase material and supplies for this project to meet the construction schedule.

6. Safety Record and Experience

6.1. Each Bidder must demonstrate that it is committed to implementing a first-rate safety program and that it has an exceptional safety and environmental record. Each Bidder must submit their current Experience Modification Rate (EMR). If an EMR is not available, each Bidder and its proposed subcontractors/subconsultants must submit a written statement detailing each one's safety records on its last 5 projects listed in the Bidder's reference., Include contact names and phone numbers where the City can verify the safety record statement. Each Bidder must provide a Log and Summary of OSHA violations and any fines or settlements for the past 36 months. Attach OSHA Form 300A - Work Related Injuries and Illnesses, as required by the U. S. Department of Labor, for the past 36 months (Provide OSHA Recordable Incident Rate (Year 2017) and OSHA Lost Days Away Incident Rate (Year 2017). This is applicable to site construction and installation activities only. (Do not submit the Bidder's Safety Manual).

16.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or Invitation To Bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. The Bidder's Georgia General Contractor's license number shall be clearly printed on the exterior of the envelope containing the sealed bid.

16.03 Bids may be mailed to the City of Forest Attention: A. Girard Greeter; 745 Forest Parkway, Forest Park GA, 30297**.**

16.04 The sealed envelope containing the Bid and Bid security shall be enclosed in a separate package plainly marked on the outside with the notation "**BID ENCLOSED – FOREST PARK - GILLEM PUBLIC SAFETY BUILDING – PROJECT NO.: 12012021";** The Bidder's Georgia General Contractor's license number shall be clearly printed on the exterior of the envelope containing the sealed bid.

16.05 Bid packages submitted shall include **one (1)** complete set of bid documents, as required by this section, with original signatures and seals as required and this document set shall be labeled "**Original**". Additionally, **two (2)** complete copy sets of the bid documents, as required by this section, labeled "**Copy**" shall be included in the bid package.

ARTICLE 17 – MODIFICATION AND WITHDRAWAL OF BID

17.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

17.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 18 – OPENING OF BIDS

18.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. A Bid Tabulation of the amounts of the Base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 19 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

19.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 20 – EVALUATION OF BIDS AND AWARD OF CONTRACT

20.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible.

20.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

20.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

20.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

20.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

20.06 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Owner.

ARTICLE 21 – CONTRACT SECURITY AND INSURANCE

21.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance.

When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 22 – SIGNING OF AGREEMENT

22.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number [five (5)] of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 calendar days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten calendar days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

SUBMITTAL CHECKLIST

This table is included for the Bidder's convenience and may be used to track the preparation and submittal of certain required information with its Bid.

Item #	Required Bid Submittal Check Sheet	Check (v)
Please enclose the following in a separate sealed envelope plainly marked "BID ENCLOSED – FOREST PARK - GILLEM PUBLIC SAFETY BUILDING – PROJECT NO.: 12012021"		
1	Bid Form	
2	Required Bid Security	
Please combine the following required items in a section clearly labeled as Volume 1		
3	Local, Small Business, Diversity Program Plan (LSBD Forms 1-4)	
4	List of 5 Project References (Form 5)	
5	State of Georgia Certificate of Existence	
6	Copy of Contractor's License	
7	Certificate of Insurance	
8	Contractor Affidavit and Agreement (Form 6a)	
9	Subcontractor Affidavit (Form 6b)	
10	Contractor's Statement of Legal Status and Financial Capability (Form 7)	
11	Certification Regarding Debarment, Suspension, and Other Matters (Form 8)	
12	Non-Collusion Affidavit (Form 9)	
13	Bidder's Contact Directory (Form 10)	
14	Acknowledgment of Addenda (Form 11)	
Please combine the following required items in a separate section labeled as Volume 2		
15	Organizational Structure/Key Personnel/Resumes	
16	Experience and Past Performance	
17	Management and Staffing Plan	
18	Quality Control Plan Approach	
19	Procurement Plan	
20	Safety Record and Experience	

FORM 7

Contractor's Statement of Legal Status and Financial Capability

For official and confidential use by the City of Forest Park, Georgia

Purpose/Instructions: The following information will be used by the City of ForestPark, Georgia in determining whether or not the identified **Contractor** has, in the opinion of the City of Forest Park, Georgia, the financial capability to successfully fulfill its obligations to the City.

If space on this form is inadequate for any requested information, please furnish on attached pages with a reference to the appropriate question number on this form.

A. Submission Information:

1. This Statement is being submitted as required by a FOREST PARK Solicitation:

   FOREST PARK Solicitation #:_____
   Project Name: _____

2. This information is current as of (date): _____

B. Contractor Information

1. Official Company/Entity Name:_____
   (hereinafter "Contractor")
2. Mailing Address:_____
   City/State/Zip: _____
3. If at this address less than 1 year, prior address:_____
   City/State/Zip:_____ _____
4. Primary contact regarding this information:_____
5. Telephone Number:_____
6. Email Address: _____

C. Development Entity. The Development entity named above is:

- ☐ A sole proprietorship ─ Soc. Sec. # _____
- ☐ A corporation ─ FID # _____
- ☐ A nonprofit or charitable institution or corporation ─ FID #_____
- ☐ A partnership_____ ─ FID # _____
- ☐ A business association or a joint venture ─ FID #_____
- ☐ A limited liability company ─ FID # _____
- ☐ A Federal, State, or local government or instrumentality thereof
- ☐ Other / explain: _____

D. Date and State of Organization. If the Contractor is not an individual or a government

agency or instrumentality:

1. Date of organization: _____

2. State of organization: _____

E. Contractor Principals. Names of owners, officers, directors, trustees, and principal representatives of the development entity

Name, Title, Address, ZIPCode	Description of interest/relationship	% of Ownership Interest

F. Contractor Affiliations. Is the Contractor a subsidiary or parent of or affiliated with, any other corporation or corporations or any other firm or firms?

□ Yes □ No

If Yes, provide the following information:

Corporation/Firm	Relationship to Contractor	Common Officers/Directors/Owners/ Trustees/Representatives
Name Address		
Name Address		

If the Contractor is different than the parent corporation or firm, will the parent corporation or firm guarantee performance under this bid?

□ Yes □ No

G. Bankruptcy. Has the Contractor or the parent corporation (if any), or any subsidiary or affiliated

corporation of the Contractor or said parent corporation, or any of the Contractor's officers or principal members, shareholders or investors filed for bankruptcy, either voluntary or involuntary, within the past 10 years?

□ Yes □ No

If Yes, provide the following information:

Name	Court	Date	Status

H. Loan Defaults. Has the Contractor or the parent corporation (if any), or any subsidiary or affiliated corporation of the Contractor or said parent corporation, or any of the Contractor's officers or principal members, shareholders or investors defaulted on a loan or other financial obligation? *(attach additional sheets if needed)*

□ Yes □ No

If Yes, explain: _____

I. Criminal Litigation. Is the Contractor or the parent corporation (if any), or any subsidiary or affiliated corporation of the Contractor or said parent corporation, or any of the Contractor's officers or principal members, shareholders or investors party to any past or pending criminal litigation?

□ Yes □ No

If Yes, provide the following information, and attach any additional information or explanation deemed necessary:

Date Filed	Court	Charge/Current Status

J. Civil Litigation. Is the Contractor or the parent corporation (if any), or any subsidiary or affiliated corporation of the Contractor or said parent corporation, or any of the Contractor's officers or principal members, shareholders or investors party to any pending civil litigation that could potentially impact the financial capability of the Contractor to complete the proposed development?

□ Yes □ No

If Yes, provide the following information, and attach any additional information or explanation deemed necessary:

Date Filed	Court	Current Status

K. Conflict of Interest. Does any member or employee of the City of Forest Park, Georgia have any direct or indirect personal interest in the Contractor or in the redevelopment or rehabilitation of the property being proposed by the Contractor?

□ Yes □ No

If Yes, explain:

L. Previous Forest Park Projects. Has the Contractor or its parent entity (if any),or any subsidiary or affiliated entity of the Contractor or said parent corporation, or any of the Contractor's officers or principal members, shareholders or investors had any previous contractual relationship with the City of Forest Park?

□ Yes □ No

Project Name	Description	Date

FORM 8

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER MATTERS

The Bidder,_____, certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal, State, or local department or agency;

2. Have not within a three-year period preceding this Bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or Contract under a public transaction; violation of Federal or State antitrust statues or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with the commission of any of the offenses enumerated in paragraph (2) of this certification; and

4. Have not within a three-year period preceding this application/Bid had one or more public transactions (Federal, State, or local) terminated for cause or default.

Where the bidder is unable to certify to any of the statements in this certification, such bidder shall attach an explanation to this Bid.

The bidder certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification.

_____
Signature of Authorized Agent

_____
Name/Title of Authorized Agent

Before me, a Notary Public, personally appeared the above named and swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to me this_____day of_____,_____.

_____
Notary Public Signature

My Commission Expires:_____[SEAL]

SECTION III

BID FORM

FOREST PARK
GILLEM PUBLIC SAFETY BUILDING

PROJECT NO.: 12012021

BID DATE: JANUARY 18, 2022

BID TIME: 2:00 PM EST

SECTION III

TABLE OF CONTENTS

SECTION III

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of Forest Park, Georgia

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with the Owner in the form included in the Bidding Documents and to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

2.02 Bidder agrees that the Owner reserves the right to reject any or all bids and also has the right to waive bidding informalities.

2.03 Bidder agrees that the bid security required for submission of this bid is to become the property of the Owner, as damages, in the event that the Contract and Bonds are not executed with the time set forth in the Contract Documents.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date

Please complete Form 11 and include with Bid documents

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained

from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.

E. Based on the information and observations referred to in Paragraph 3.01.D above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

F. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

G. Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner is acceptable to Bidder.

H. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s). Any incomplete or illegible bid prices will make this bid subject to rejection by the Owner:

The Bidder proposed to furnish all services, labor, and materials required by them for the entire work and to include a "**Construction Contingency Allowance**" amount equal to five percent (5%) of the "**Lump Sum Base Bid Amount**" indicated below within the "**Lump Sum Base Bid**" in accordance with said documents for the sum of:

5.02 **LUMP SUM BASE BID:**

(Lump Sum Base Bid in Words:) _____

_____ **Dollars**

(In Numbers:) $ _____

Which sum is hereinafter called the "Base Bid".

The undersigned further proposes that should any of the following Alternates (*referred to Spec Section 01 23 00 for descriptions*) be accepted and be incorporated in the Contract, the Base Bid will be altered in each case as follows:

Alternate No. 1 – Overhead Sectional Doors In lieu of Four-Fold Folding Doors at Apparatus Bay:

DEDUCT $_____

($_____) Dollars

Alternate No. 2 – Omit Plymovent Exhaust Extraction System:

DEDUCT $_____

($_____) Dollars

Alternate No. 3 – Omit all site lighting:

DEDUCT $_____

($_____) Dollars

SECTION III

Alternate No. 4 – Omit all FF&E and Food Service Equipment:

DEDUCT $_____

($_____) Dollars

Alternate No. 5 – Utilize Fiber-Cement cladding system in lieu of Composite Metal Panel system:

DEDUCT $_____

($_____) Dollars

Alternate No. 6 – Omit Stainless Steel Corner Guards:

DEDUCT $_____

($_____) Dollars

Alternate No. 7 – Omit Lightning Protection System:

DEDUCT $_____

($_____) Dollars

SECTION III

ITEM	UNIT	COST/UNIT	ALLOWANCE
Unit Price Allowance No. 1 – Unsuitable Material: Removal and disposal off-site of unsuitable materials. Removal must be approved by, monitored, and quantified by the Owner's Geotechnical Engineer. Note: Contractor shall include 500 cubic yards of removal and disposal off-site of unsuitable materials in the base bid price **in addition to** what is required to achieve design grades.	500 CY	_____/CY	$_____
Unit Price Allowance No. 2 – Suitable Soils: Provide suitable soil from off-site and compact in place to replace excavated rock or unsuitable soil. Haul in and compaction must be approved by, monitored, and quantified by the Owner's Geotechnical Engineer. Note: Contractor shall include 500 cubic yards of haul in and compacted suitable soils from off-site in the base bid price **in addition to** what is required to achieve design	500 CY	_____/CY	$_____
Unit Price Allowance No. 3 – #57 Stone or GAB: Haul in #57 stone or GAB to replace excavated rock or unsuitable soil. Haul in and placement must be approved by, monitored, and quantified by the Owner's Geotechnical Engineer. Note: Contractor shall include 100 tons of haul in and placement of #57 stone or GAB in the base bid price **in addition to** what is shown on the Civil Drawings.	100 TONS	/TON	$_____
Unit Price Allowance No. 4 – Geotechnical Fabric: Material and placement of geotechnical Fabric (Mirafi 600X or equal) To be used as directed by Architect, without restriction at the unit price. Note: Contractor shall include 100 square yards of geotechnical fabric in the base bid price.	100 SY	_____/SY	$_____
Unit Price Allowance No. 5 – Construction Contingency: Provide a contingency allowance in the amount of 5% of the lump sum base bid amount.	N/A	5%	$_____

These Unit Prices and Allowances are submitted as part of the Lump Sum Bid: The BIDDER declares that they understand the Contract Some may be decreased at the unit prices listed above. The BIDDER declares they understand that the quantities of work shown are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the BIDDER proposed to do the additional work at the unit prices listed herein; and should the quantities be decreased, the BIDDER also understands that payment will be made on the basis of actual quantities at the unit price proposal and will make no claim for anticipated profits for any decrease in quantities and that the actual quantities will be determined upon completion of the work; at which time adjustment will be made to the Contract Some.

SECTION III

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within **360** calendar days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within **420** calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid Security (5%);

B. LSBD Forms 1-4 ;

C. List of 5 Project References (Section XVII – Reference and Release Form);

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

E. Copy of Contractor's License *[or]* Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain the following said license within the time for acceptance of Bids:

1. **Georgia's General Contractor License(s),**

F. Certificate of Insurance (City of Forest Park as the Certificate Holder);

G. Contractor Affidavit and Agreement (Form 6a);

H. Subcontractor Affidavit (if available) (Form 6b);

I. Contractor's Statement of Legal Status and Financial Capability (Form7);

J. Certification Regarding Debarment, Suspension, and Other Matters (Form 8);

K. Non-Collusion Affidavit (Form 9);

L. Bidder's Contact Directory (Form 10);

M. Acknowledgment of Addenda (Form 11);

N. Required Bidder Qualification Statement with Supporting Data for the following:

1. **Organizational Structure/Key Personnel and Resumes:**
2. **Overall Project Experience, Qualifications, and Performance on Previous Similar Projects**

SECTION III

3. **Management and Staffing Plan**
4. **Quality Control Plan Approach**
5. **Procurement Plan**
6. **Safety Record and Experience**

7.02 **To be submitted post-award:** LSBD Participation Report – Contract Goal: Report detailing percentage of LSBD participation (work performed) and payments to VOB/MBE/WBE/DBE subcontractors on a monthly basis.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

SECTION III

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest _____

Date of Qualification to do business in _____ is ____/____/____.

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____(SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

SECTION III

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

_____

Phone No. _____ Fax No. _____

E-mail _____ _____

SUBMITTED on _____, 20____.
Georgia General Contractor License No. _____.

SECTION III

FORM 11

ACKNOWLEDGMENT OF ADDENDA

The undersigned Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Dated	Acknowledge Receipt (initial)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

☐ **No addenda were received**:

Acknowledged for: _____
(Name of Bidder)

By: _____
(Signature of Authorized Representative)

Name:_____
(Print or Type)

Title: _____

Date: _____

SECTION III

FORM 9

NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding. He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee gift, commission or thing of value on account of such sale.

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING RESPONSE ARE TRUE AND CORRECT.

Dated this_____day of_____, _____

_____
(Name of Organization)

_____ _____
(Print Name) (Title)

_____
(Signature)

Before me, a Notary Public, personally appeared the above named and swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to me this_____day of_____,_____.

Notary Public Signature _____

My Commission Expires: _____

SECTION III

FORM 10
CONTACT DIRECTORY

Bidder's Name: _____

NAME	POSITION/TITLE (JV Relationship, if applicable) *	MAILING ADDRESS	PHONE NUMBER	EMAIL ADDRESS

The purpose of the Bidder Contact Directory is to provide the City with a centralized, easily identified source of important contacts and other information regarding each of the business entities constituting a Bid. This Bidder Contact Directory must include the names, positions/titles, firms, mailing addresses, phone and fax numbers and e-mail addresses for at least one (1) primary contact, and names, positions, titles of at least one (1) secondary contact, where applicable, authorized to represent the firm for purposes of this solicitation.

**Joint Ventures established less than three (3) years must include at least one (1) primary contact for each member*

SECTION VI

FORM 6a

CONTRACTOR AFFIDAVIT AND AGREEMENT

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A § 13-10-91 related to any contract to which Contractor is a party that is subject to O.C.G.A. § 13-10-91 and hereby verifies its compliance with O.C.G.A. § 13-10-91, attesting as follows: **(a)** the Contractor has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program; **(b)** the Contractor will continue to use the federal work authorization program throughout the contract period, including any renewal or extension thereof; **(c)** the Contractor will notify the public employer in the event the Contractor ceases to utilize the federal work authorization program during the contract period, including renewals or extensions thereof; **(d)** the Contractor understands that ceasing to utilize the federal work authorization program constitutes a material breach of Contract; **(e)** the Contractor will contract for the performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the Contractor with the information required by O.C.G.A. § 13-10-91(a), (b), and (c); **(f)** the Contractor acknowledges and agrees that this Affidavit shall be incorporated into any contract(s) subject to the provisions of O.C.G.A. § 13-10- 91 for the project listed below to which Contractor is a party after the date hereof without further action or consent by Contractor; and **(g)** Contractor acknowledges its responsibility to submit copies of any affidavits, drivers' licenses, and identification cards required pursuant to O.C.G.A. § 13-10-91 to the public employer within five business days of receipt.

_____ _____

Federal Work Authorization User Identification Number Date of Authorization *(mm/dd/yyyy*)

_____ _____

Name of Contractor (*Legal Name of Offeror)* Name of Project/Solicitation Number

_____

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ___, 20__ in _____ (City), _____(State).

_____

Signature of Authorized Officer or Agent

_____

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,20__.

_____

NOTARY PUBLIC

My Commission Expires: _____

The signature dates for both the authorized representative and notary public must be the same.

RETURN THIS FORM WITH BID DOCUMENTS

SECTION VII

FORM 6b
SUBCONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services under a contract with (name of contractor) on behalf of (name of public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A § 13-10-91. Furthermore, the undersigned subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five (5) business days of receipt. If the undersigned subcontractor receives notice that a sub-subcontractor has received an affidavit from any other contracted sub-subcontractor, the undersigned subcontractor must forward, within five business days of receipt, a copy of the notice to the contractor. Subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____ _____

Federal Work Authorization User Identification Number Date of Authorization (*mm/dd/yyyy*)

_____ _____

Name of Subcontractor (*Legal Name)* Name of Project/Solicitation Number

_____

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ___, 20__ in _____(City), _____(State).

_____

Signature of Authorized Officer or Agent

_____

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,20__.

_____

NOTARY PUBLIC

My Commission Expires: _____

The signature dates for both the authorized representative and notary public must be the same.

RETURN THIS FORM WITH BID DOCUMENTS

SECTION VIII

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

THIS AGREEMENT is by and between **City of Forest Park, Georgia** ("Owner") and _____ ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: All material, labor, tools, equipment, and any other miscellaneous items necessary to complete the work as described in the Construction Drawings & Specifications.

ARTICLE 2 – THE PROJECT

The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: City of Forest Park, Georgia's "Gillem Public Safety Building – Project No.: 12012021". The work consists of furnishing and installing all materials, labor, tools, equipment, and related services required for a complete project. This project includes but is not limited to providing the construction of a complete public safety facility on Anvil Block Road in accordance with the Contract Documents.

ARTICLE 3 – ENGINEER/ARCHITECT (OWNER'S REPRESENTATIVE)

3.01 The Project has been designed by **Precision Planning, Inc. (Architect)** and is the design architect of record and reviewed by **Falcon Design LLC(Engineer)**. **Falcon Design LLC** is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer by the Owner and in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within **360** days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed

and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within **420** days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner **$1,000** for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **$250** for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A below:

A. For all Work at the Unit Price Base Bid of: _____ **DOLLARS ($ _____)**

B. All specific cash allowances are included in the above price in accordance with Paragraph 11.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of PAYMENTS*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.

    a. 90 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

    b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 1.0 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

E. Based on the information and observations referred to in Paragraph 8.01.D above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

F. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

G. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

H. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement.
2. Performance Bond.
3. Payment Bond.
4. General Conditions.
5. Supplemental General Conditions
6. Specifications (Including Georgia Department of Transportation – Standard Specifications Construction of Transportation Systems – April 18, 2013 or latest edition).
7. Drawings
8. Addenda.

9. Exhibits to this Agreement (enumerated as follows):

    a. Contractor's Bid.

    b. Documentation submitted by Contractor prior to Notice of Award.

    c. Certificate of Insurance.

10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

    a. Notice to Proceed.

    b. Work Change Directives.

    c. Change Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, in respect to all covenants, agreements, and obligations contained in the Contract Documents.

SECTION VIII

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

SECTION VIII

10.06 *Other Provisions*

1. *Indemnification:* The CONTRACTOR shall indemnify and hold harmless the OWNER and Consulting ENGINEER (also known as Falcon Design Consultants, LLC) and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the WORK, provided that any such claim, damage, loss, expense or attorney's fees is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom, and is caused in whole or in part by any negligent act or omission of the CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not the negligent act is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Clause. In any and all claims against the OWNER or the Consulting ENGINEER (Falcon Design Consultants, LLC) or any of their agents or employees, by any employee of the CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation set forth in this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any Subcontractor under workers' or workman's compensation acts, disability benefit acts or other employee benefit acts.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER:	CONTRACTOR
City of Forest Park, Georgia	_____
By: _____	By: _____
Title: _____	Title: _____
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest: _____	Attest: _____
Title: _____	Title: _____
Address for giving notices:	Address for giving notices:
745 Forest Parkway	_____
Forest Park, GA 30297	_____
Phone: (404) 366-4720	Phone: _____
	License No.: _____
	(Where applicable)
	Agent for service of process:
	_____

SECTION IX

NOTICE TO PROCEED

Date: _____

Project: **Forest Park – Gillem Public Safety Building**

Owner: City of Forest Park, Georgia	Owner's Contract No.: **Project No.: 12012021**
Contract:	Engineer's Project No.:
Contractor:	
Contractor's Address:	

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Completion is _____, and the number of consecutive calendar days to achieve Substantial Completion is **360**, and the number of consecutive calendar days to achieve readiness for Final Completion including Closeout Documents is **420**.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Contractor:	Owner: **CITY OF FOREST PARK**
Authorized Signature	Authorized Signature
Title	Title
Date	Date

SECTION X

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):
City of Forest Park, Georgia
745 Forest Parkway
Forest, GA 30297

CONTRACT
Effective Date of Agreement:
Amount: **$ _____.**
Description (*Name and Location*): Forest Park Gillem Public Safety Building

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ (Seal)	_____ (Seal)
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
_____	_____
Title	Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

SECTION X

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.

2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
   - 2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
   - 2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
   - 2.3 Owner has agreed to pay the Balance of the Contract Price to:
     1. Surety in accordance with the terms of the Contract; or
     2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.

3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:

   - 3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
   - 3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
   - 3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
   - 3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
     1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
     2. Deny liability in whole or in part and notify Owner citing reasons therefor.

4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

SECTION X

5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted here from and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

11. Definitions.

11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

SECTION X

11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – (*Name, Address and Telephone*) Surety Agency or Broker: Owner's Representative (*Engineer or other party*):

SECTION XI

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):
City of Forest Park, Georgia
745 Forest Parkway
Forest Park, GA 30297

CONTRACT
Effective Date of Agreement:
Amount: **$ _____.**
Description *(Name and Location)*: Forest Park
Gillem Public Safety Building

BOND
Bond Number:
Date (*Not earlier than Effective Date of Agreement*):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ (Seal)	_____ (Seal)
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
_____	_____
Title	Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

SECTION XI

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2 Claimants who do not have a direct contract with Contractor:

1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.

6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:

6.1 Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2 Pay or arrange for payment of any undisputed amounts.

7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are

dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – (*Name, Address, and Telephone*) Surety Agency or Broker: Owner's Representative (*Engineer or other*):

SECTION XII

CERTIFICATE OF CONTRACTOR'S ATTORNEY

I, the undersigned, _____, the duly authorized and

acting legal representative of (Contractor)_____,
do hereby certify as follows:

I have examined the attached Contract and Performance and Payment Bond and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements are adequate and have been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Signature: _____

Date: _____

SECTION XIII

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of the **City of Forest Park, Georgia**, do hereby certify as follows:

I have examined the attached Contract and the manner of execution thereof by the authorized City representatives, and I am of the opinion that each of the aforesaid agreements are adequate and have been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the City of Forest Park, Georgia; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Signature: _____

Date: _____

SECTION XIV

GENERAL CONDITIONS

TABLE OF CONTENTS

Page

SECTION XIV

SECTION XIV

SECTION XIV

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop

Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the condition's precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

   a. does not conform to the Contract Documents; or

   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

   c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to three printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 15th day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 15 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during

performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

    a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

    b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

    1. A Field Order;

    2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

    3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

    1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

    2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole

risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Not Used

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to require a change in the Contract Documents; or

2. differs materially from that shown or indicated in the Contract Documents; or

3. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data;

b. locating all Underground Facilities shown or indicated in the Contract Documents;

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor

shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which

such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. Not Used

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of contractors or subcontractors operations or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Bid, Performance, Payment, and Other Bonds*

A. Contractor shall furnish a Bid security made payable to Owner in an amount of **5 percent.** The Bid security will be retained until such Contractor has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. Contractor shall also furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority

to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor’s Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers’ compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds for ongoing and completed operations, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary and non-contributory coverage for all claims covered thereby. ISO additional insured endorsements CG(2010-07/04) and CG(2037-07/04) or their equivalence shall be utilized;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

   a. Such insurance shall remain in effect for five years after final payment.

   b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

Not Used

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

   1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

   2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained

on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Not Used

B. Not Used

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

Not Used

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material

or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Engineer determines that:

        1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

        2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

        3) it has a proven record of performance and availability of responsive service.

    b. Contractor certifies that, if approved and incorporated into the Work:

        1) there will be no increase in cost to the Owner or increase in Contract Times; and

        2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

    a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

    b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

    c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

    d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

        1) shall certify that the proposed substitute item will:

            a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes

in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. Not Used

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

    a. Submit number of copies specified in the General Requirements.

    b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

    a. Submit number of Samples specified in the Specifications.

    b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

    a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

    b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

    c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

    d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is

not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials

and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Not Used

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise).

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

SECTION XIV

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment

in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

    a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

    b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

    c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

    d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

    e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

    f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will

conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend

payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

    a. the Work has progressed to the point indicated;

    b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

    c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

    a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

    b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work, or

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

    d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in

Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Twenty days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part

of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. Not Used

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 7 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. Not Used

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

SECTION XIV

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the State of Georgia.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION XV

SUPPLEMENTARY CONDITIONS

1. **THE GENERAL CONDITIONS:** The General Conditions shall apply to all work in the Contract Documents, except as otherwise specified in the Supplementary Conditions. Requirements of the Supplementary Conditions supersede those of the General Conditions.

2. **COMMENCEMENT AND COMPLETION OF WORK:** The Contractor shall commence the Work on the date indicated in the Notice to Proceed and shall diligently prosecute said Work so as to complete the entire projects and place them in use within the number of calendar days set forth in the Agreement.

3. **SCOPE OF WORK:** The project includes but is not limited to the construction of the "Gillem Public Safety Building". The work consists of furnishing and installing all materials, labor, tools, equipment, and related services required for a complete project. This project includes but is not limited to providing the site improvements and construction of a complete public safety facility and appurtenances on Anvil Block Road in accordance with the complete design plans and these Contract Documents and Technical Specifications.

4. **LOCATION:** The work under this Contract will be located at 2090 Anvil Block Road, Forest Park, Georgia 30292; Clayton County, GA.

5. **EXTENSION OF TIME AND FAILURE TO COMPLETE ON TIME:** Any and all extensions of time shall be in accordance with the General Conditions, except as otherwise hereinafter provided. Failure to complete the Project on or before the stipulated completion date will result in the assessment of liquidated damages in the amount stated in the Proposal.

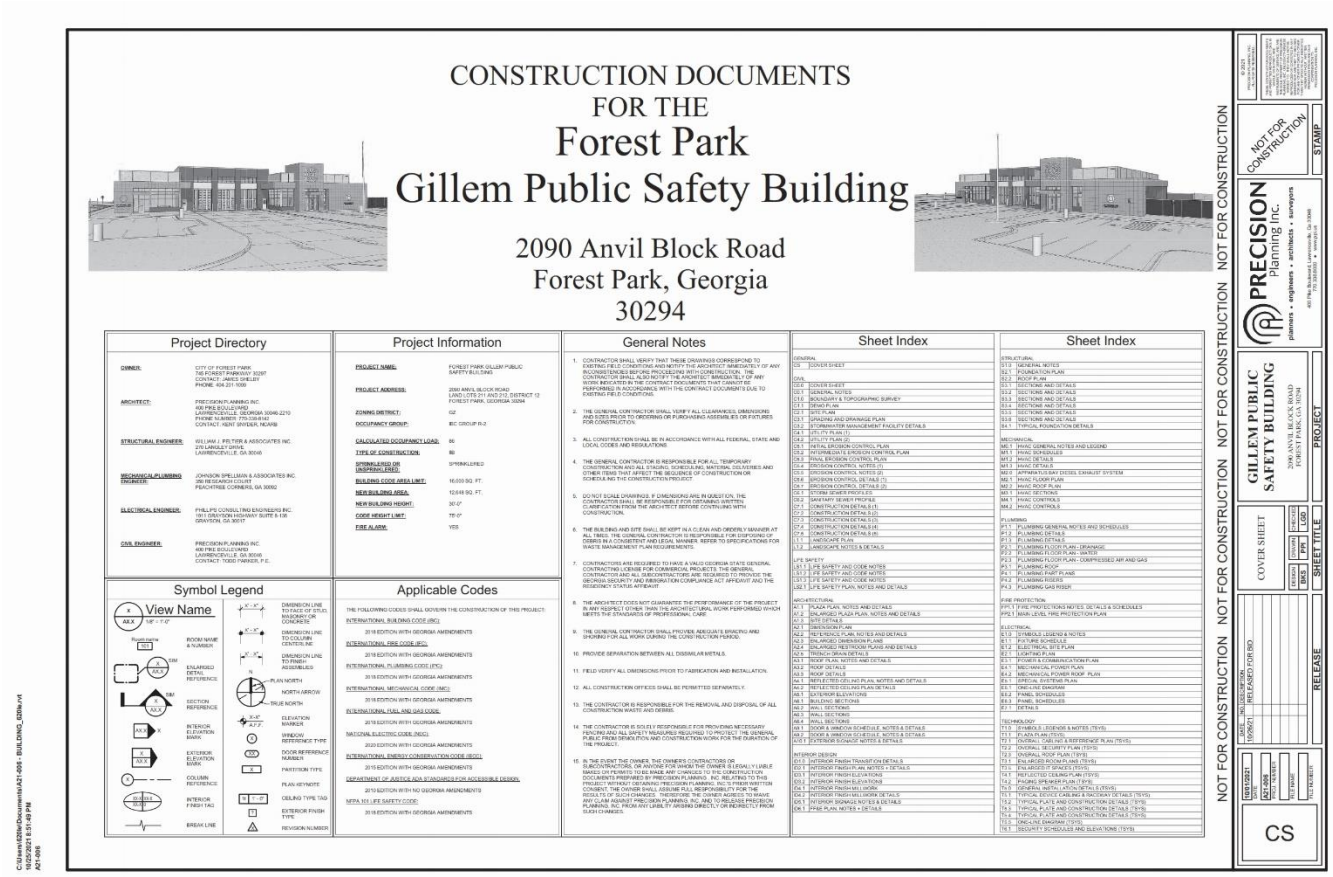
6. **WEATHER DELAYS:** Completion time will not be extended for normal bad weather. Time for completion as stated in the Contract Documents includes an allowance for calendar days on which work cannot be performed out-of-doors. The term "calendar day" as used in the Contract Documents shall mean Mondays through Fridays, excluding weekends and legal holidays. For the purpose of this Contract, Contractor agrees that he may expect to lose calendar days due to weather in accordance with the following table:

January - 14 days	**February - 14 days**	**March - 10 days**	**April - 7 days**
May - 6 days	**June - 3 days**	**July - 4 days**	**August - 2 days**
September - 2 days	**October - 3 days**	**November - 5 days**	**December - 9 days**

The Contractor agrees that it shall provide written notice to the OWNER'S REPRESENTATIVE on the day of any adverse weather not anticipated and for which a request for a time extension has been, or will be, made. Said notice shall state with particularity a description of the adverse weather as well as a description of the nature and extent of any delay caused by such weather. Receipt of this notice by the OWNER'S REPRESENTATIVE is a condition precedent to the submission of any claim for an extension of time. Furthermore, the Contractor shall submit a written claim for extension of time within seven (7) days after the occurrence of the adverse weather and such claim shall be supported by such documentation including, but not limited to, official weather reports,

as the OWNER'S REPRESENTATIVE may require. No extension will be made for days of bad weather occurring after the building is dried in. Requested working days lost to the weather shall be submitted for review with the pay request for that month, any requests later than the billable month will not be considered. To the extent that any of the terms and conditions set forth in this paragraph are in conflict with any of the terms and conditions of this Agreement, the terms and conditions of this paragraph shall govern and control.

7. **CONSTRUCTION DRAWINGS:** The work shall conform to the following construction drawings "Construction Documents for the Forest Park Gillem Public Safety Building" as shown on cover sheet for this project with a complete sheet index of including drawings:



8. **REPORTS AND DRAWINGS USED:** In the preparation of Drawings and Specifications, Architect has relied upon:

A. The following reports of explorations and test of subsurface conditions at the site of the Work:

1) Geotechnical Report from Materials Managers and Engineers, Inc. (2MNEXT) and dated July 2, 2021. Report is included in these Contract Documents as Section XVI – Geotechnical Testing Report.

B. The following drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are contiguous to the site of the Work.

1) None

9. **SANITARY CONVENIENCES:** THE CONTRACTOR shall provide adequate sanitary conveniences for use of those employed on the work and their use shall be strictly enforced. Such conveniences shall be made available when the first employees arrive on the site and shall be removed after the departure of the last employees from the job.

10. **ENVIRONMENTAL IMPACT:** THE CONTRACTOR shall conduct all operations so as to minimize, to the greatest extent possible, adverse environmental impact.

A. **NOISE:** All equipment and machinery shall be provided with exhaust mufflers maintained in good working order so as to reduce operating noise to minimum levels.

B. **DUST/SMOKE:** All equipment movements shall be accompanied by a minimum of dust. Traveled surfaces and earthwork shall be maintained in a moist condition to avoid the generation of dust or the airborne movement of particulate matter under all prevailing atmosphere conditions. Burning operations will be conducted only with written permission of the OWNER and/or appropriate regulatory agency. The CONTRACTOR shall be responsible for obtaining all permits and comply with all codes, ordinances and regulations pertaining to the burning.

C. **TRAFFIC:** Equipment and vehicles related to this project shall be routed over roads which will result in the least effect on traffic and nuisance to the public. All material shall be loaded in a manner which will preclude the loss of any portion of the load in transit, including covering, if necessary.

D. **SEDIMENTATION:** All points of concentrated runoff from rainfall shall be visually monitored to determine that no eroded material from the construction site is being deposited offsite. Measures shall be taken to promptly eliminate such a deposition if occurring, including the installation of detention basins. All work shall be performed per the "Georgia Soil and Water Conservation Commission - Manual for Erosion and Sediment Control in Georgia – 2016 Edition or latest revision"

11. **PROJECT VIDEO RECORDING:** Contractor is to provide a full color video survey of the complete project limits to the Owner. This video is to be taken within 72 hours of the Contractor's mobilization and start of the project and delivered to the OWNER'S REPRESENTATIVE.

12. **PROJECT PHOTO LOG:** Contractor is required to take daily digital progress photos of the work being performed. These photos are required to show a TIME/DATE stamp directly on each picture. Minimum 10M resolution required. Photos are to be delivered to the OWNER'S REPRESENTATIVE monthly with each pay request submitted.

SECTION XV

13. **CONSTRUCTION STAKEOUT:** If requested by the CONTRACTOR, the OWNER'S REPRESENTATIVE will provide benchmarks and baseline coordination's for horizontal and vertical control at the site of the work. From the baselines and benchmarks the CONTRACTOR shall complete the layout of the work and shall be responsible for all measurements that may be required for the executions of the work prescribed in the specifications or on the Drawings, subject to such modifications as may be required to meet changed conditions or as a result of necessary modifications to the Work.

    The CONTRACTOR shall furnish, at his own expense, all such stakes, spikes, steel pins, templates, platforms, equipment, instruments, tools and material and all labor as may be required in laying out any part of the Work from the baselines and benchmarks.

    It shall be the responsibility of the CONTRACTOR to maintain and preserve all stakes and other marks established by the OWNER'S REPRESENTATIVE until authorized to remove them, and if such marks are destroyed by the Contractor or through his negligence prior to their authorized removal, they may be replaced by the OWNER'S REPRESENTATIVE at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the CONTRACTOR.

    All survey data shall be recorded in accordance with standard and approved methods. All field notes, sketches, records and computations made by the CONTRACTOR in laying out the work shall be available at all times during the progress of the work for the ready examination by the OWNER'S REPRESENTATIVE or his duly authorized representative.

    The OWNER'S REPRESENTATIVE may make original and final surveys and make computations to determine the quantities of work performed or finally in place, if required.

    The CONTRACTOR shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations and other records, or facsimile copies thereof, taken by the CONTRACTOR for the purpose of construction and for progress surveys, shall be furnished promptly to the representative of the OWNER'S REPRESENTATIVE for permanent records and for determining the proper amount of progress payments due to the CONTRACTOR. Unless waived in each specific case, quantity surveys made by the CONTRACTOR shall be made during the presence of a representative of the OWNER'S REPRESENTATIVE.

    THE OWNER'S REPRESENTATIVE may make checks as the work progresses to verify lines and grades established by the CONTACTOR and to determine the conformance of the completed work as it progresses with the requirements of Contract Documents and Drawings. Such as checking by the OWNER'S REPRESENTATIVE or his representative shall not relieve the CONTRACTOR of his responsibility to perform all work in accordance with the Contract Documents and Drawings and the lines and grades given therein. In the event that location marks as established by the CONTRACTOR are found to be inaccurate or inadequate, work shall be

suspended until corrections have been made.

Contractor to provide Owner with complete electronic GIS survey based upon State Plane Coordinate System of all improvements including all subsurface structures related to the completed project.

No separate payment will be made for the costs involved in the survey work, layout work or staking performed by the CONTRACTOR. All such costs will be considered as incidental to the Work.

14. **UTILITIES:** Utilities such as sewer, water and electric lines encountered in the work shall be protected from Injury and maintained in service until moved or replaced as required under this Contract or by others as the case may be, or abandoned as may be necessary for this proper construction and use of the new work. State law requires that the contractor call Georgia811 at 811 or 1-800-282-7411 at least 72 hours in advance of construction commencing.

15. **ADJUSTMENT OF DISCREPANCIES:** In all cases of discrepancies between the various dimensions and details shown on drawings, or between the drawings are these specifications, the more expensive construction shall be estimated before construction is started, the matter shall be submitted to the OWNER'S REPRESENTATIVE for clarification. Without such a decision, discrepancies shall be adjusted by the CONTRACTOR at his own risk and in settlement of any complications arising from such adjustment, the CONTRACTOR shall bear all of the extra expense involved.

16. **RESTORATION:** The CONTRACTOR shall conduct his operations so that restoration of roadways, driveways, curb and gutter, ditches and easements progresses along with the pipe laying. If the OWNER'S REPRESENTATIVE determines that inadequate progress is being made with the restoration, he may shut down the CONTRACTOR's pipe laying operation until the restoration is caught up with the pipe installation. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

17. **MAINTENANCE DURING CONSTRUCTION:** The CONTRACTOR shall maintain the Work from the beginning of construction operations until final acceptance. This maintenance shall continue continuous and effective work prosecuted day by day with adequate equipment and forces to the end that site and structures thereon are kept in satisfactory condition at all times, including satisfactory signing or marking as appropriate and control of traffic where required by use of traffic control devices as required by the State in which this project is located.

    Upon completion of the Work, the CONTRACTOR shall remove all construction signs and barriers before final acceptance. While undergoing improvements, the roads shall be kept open to all traffic by the CONTRACTOR. The CONTRACTOR shall keep the portion of the site being used by public traffic, whether it be through or local traffic, in such condition that traffic will be adequately accommodated. The CONTRACTOR shall bear all cost of signs and markings as required and other

maintenance work during construction and before the Work is accept and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary without direct compensation.

18. **BARRICADES, DANGER, WARNING AND DETOUR SIGNS:** The CONTRACTOR shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public. Highways and streets closed to traffic shall be protected by effective barricades, and obstructions shall be lighted during hours of darkness. Suitable warning signs shall be provided to properly control and direct traffic Barricades, danger, warning and detour signs shall be installed as per Georgia DOT Specifications, Section 107.07 – Public Convenience and Safety and Section -150 Traffic Control in accordance with "Georgia Department of Transportation – Standard Specifications Construction of Transportation Systems – January 21, 2021 or latest revision"

    The CONTRACTOR shall furnish, install, and maintain all necessary barricades, warning sings, and other protection devices in accordance with the State requirements in which the project is located. Temporary signs may be reused, provided they are in good condition and legible. All protective devices shall be kept in good, legible condition while in use. All work and materials provides shall be per the "Manual on Uniform Traffic Control Devices for Streets and Highways – 2009 MUTCD with Revisions 1 and 2, May 2012 or latest revision"

    As soon as construction advances to the extent that temporary barricades, and signs are no longer needed to inform the traveling public, such signs shall be promptly removed.

    The cost of furnishing, erecting, maintaining, and removing protective devices will not be paid for as a separate Bid Item. Where the CONTRACTOR is required to perform any of these functions, the cost thereof shall be included in the overall Bid submitted. Ownership of the temporary warning devices shall remain with the CONTACTOR.

19. **HIGH VOLTAGE ACT:** The CONTRACTOR acknowledges the requirement of the High Voltage Act of the General Assembly of Georgia by execution of this Contract.

20. **ACCESS FOR INSPECTION:** Access for inspection shall be provided for representatives of the OWNER, OWNER'S REPRESENTATIVE, ARCHITECT and applicable regulatory agencies.

21. **INSURANCE:** The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

    a. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions shall not contain an exclusion for any owner or officer that will be present on the project site at any time and provide coverage for not less than the following amounts:
        i. State: Statutory

ii. Applicable Federal
iii. Employer's Liability:
1. Each Accident – $1,000,000
2. Bodily Injury by Disease Policy Limit - $1,000,000
3. Each Employee for Bodily Injury By Disease - $1,000,000

b. Contractor's Commercial General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions covering liability arising from premises, operations, products-completed operations, personal and advertising liability, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract), and contractual liability coverages not less than the following amounts:
i. General Aggregate (applying per project) $2,000,000
c. Products - Completed
i. Operations Aggregate $2,000,000
d. Personal and Advertising
i. Injury $1,000,000
e. Each Occurrence
i. $1,000,000
f. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverages where applicable.
g. Excess or Umbrella Liability- Coverage is to be excess of the Commercial General Liability, Automobile Liability and Employers' Liability as underlying policies. The limits of liability may be provided by a combination of primary and excess or umbrella liability policies , but in no event may the total limits of liability available for any one occurrence or accident be less than the below limits:
i. General Aggregate $5,000,000
ii. Each Occurrence $5,000,000
h. Automobile Liability-Business Automobile Liability insurance covering all owned, non-owned and hired vehicles with limits not less than the following amounts:
i. Combined Single Limit
i. Each Accident $1,000,000
j. Contractor's Liability Insurance
i. Policy Limit:
$1,000,000 Per Claim
$1,000,000 Aggregate
ii. Claims Expenses (including Defense Costs) within limits
$25,000 Deductible per loss.
iii. Coverage will include Bodily Injury or Property Damage, including Clean-Up costs, from a pollution event from covered operations or completed operations of the Work performed at the project Site by the Contractor or Sub-Contractors.

k. Builders Risk Insurance (Special Form)
i. The contractor shall procure and shall maintain during the life of the contractor agreement Builder's Risk Insurance to protect the Owner as the First Named Insured along with the Contractor as a Named Insured against All-Risks perils of

property insurance including flood and earthquake. The amount of insurance shall be the equal of 100% of the completed value of the project.

l. Property insurance covering the Contractors and Sub-contractors business personal property and its equipment shall be the responsibility of the respective parties.

m.

22. **SUBCONTRACTORS:** The Contractor shall not contract with any person or entity to whom the Owner or the OWNER'S REPRESENTATIVE has made reasonable objection. The Contractor shall not be required to contract anyone to whom he has a reasonable objection.

23. **SAFETY AND PROTECTION:** Attention is invited to the regulations issued by OSHA 2207 and the Department of Labor pursuant to Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333) entitled "Safety and Health Regulations for Construction" (29 CFR Part 1926 910) July 1, 1993 edition. The Contractor shall be required to comply with those regulations to the extent that any resulting Contract involves construction.

24. **RETAINAGE OF CONTRACTORS PAYMENT:** The retainage shall be an amount equal to 10% of Contractor's partial pay estimate until 50% completion. Provided that satisfactory progress is being made toward completion of the work, no additional retainage will be held until the work is substantially complete. However, if progress is not satisfactory in the opinion of the OWNER'S REPRESENTATIVE, retainage may be reinstated to the fullest extent provided by the General Conditions. Upon substantial completion of the work, any amount retained may be paid to the CONTRACTOR. When the WORK has been substantially completed except for WORK which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgement of the OWNER are valid reasons for non-completion, the OWNER may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the WORK still to be completed. Partial pay estimates may include stored materials. Contractor must submit invoices and all materials must be located at the site of work. Retainage will be held on stored materials.
    a. Retainage shall be invested at the current market rate and any interest earned on the retained amount by Owner shall be paid to the contractor when the project has been completed within the time limits specified and for the price specified in the contract, or in any amendments or change orders approved in accord with the terms of the contract, pursuant to the General Conditions.

25. **SEWER CONSTRUCTION:** Construction is to be carried out so as to prevent by-passing of flows during construction. The Contractor shall provide the necessary pumps, force mains and etc. required to handle sewage flows during construction.

26. **SEDIMENT AND EROSION CONTROL:** Siltation and soil erosion must be minimized during construction. Contractor shall take measures necessary to stop soil erosion at the source.

27. **SITE RESTORATION:** Restore disturbed areas to original or better conditions.

28. **USE OF CHEMICALS:** All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or other classification, must

show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

29. **TESTING:** The testing laboratory will be retained by the Owner. Testing required by the plans and specifications will be performed at the discretion and under the direction of the OWNER'S REPRESENTATIVE. Payment for conformance will be made by the Owner. Copies of all test results will be forwarded in duplicate to the OWNER'S REPRESENTATIVE. The Contractor shall maintain a current file on the jobsite of all test results for review.

30. **OWNERSHIP OF DEMOLISHED EQUIPMENT:** Any major equipment removed as a result of this project shall remain the property of the OWNER. The Contractor shall take reasonable care to protect equipment during removal and shall deliver the equipment for permanent storage to a point to be designated by the OWNER.

31. **RECORD DRAWINGS:** The Contractor shall maintain a red lined set of construction drawings indicating any field changes to the Drawings. The information shall include physical measurements or coordinates for the horizontal location of key physical features such as bends in underground pipelines and vertical elevations of the equipment or pipelines. As a prerequisite to final payment of the Retainage, the Contractor shall deliver to the OWNER'S REPRESENTATIVE the marked up set of drawings for preparation of the Record Drawings of the Work. Failure to maintain this information shall not relieve the Contractor of the responsibility of obtaining the information prior to final payment.

32. **OPERATION AND MAINTENANCE MANUALS:** The Contractor shall assemble all O&M manuals called for in the various sections of the Technical Specifications into one or more volumes of either 3-ring or post and screw type binders. The binders shall be labeled, indexed and tabbed for easy location of information by Specification Section Number and Description. Three (3) copies of all O&M manuals organized into 3 separate books shall be submitted to the OWNER'S REPRESENTATIVE as a prerequisite to final payment of the retainage. Additionally, three copies of all O&M manuals shall also be provided in complete PDF format on CD's and furnished with the delivery of the hardcopy manuals.

33. **QUALIFICATIONS FOR ACCEPTABLE SURETIES:** A surety, to be acceptable, will be required to meet the following criteria:
    a. A company holding a Certificate of Authority as an acceptable surety on Federal Bonds, as published in the latest such listing in the Federal Register; and an insurance company licensed to do business within the state of Georgia as a company writing policies of insurance and/or bid bonds, payment bonds and performance bonds, regulated as such by the Georgia Department of Insurance and Solvency Pool, and meet the following additional criteria:

    1) A company with a rating in the A.M. Best Companies' most recent published rating of "A++ or A+: Class IV or Larger."

2) A company with a rating in the A.M. Best Companies' most recent published rating of "A: Class V or Larger."

3) A company with a rating in the A.M. Best Companies' most recent published rating of "A-: Class X or Larger."

4) A company which can furnish an assumption certificate or cut through clause in a statement of coverage under which payment is guaranteed 100% to third-party claimants by a reinsurer with a rating in A.M. Best Companies' most recent published rating of "A or A+: Class V or Larger"

5) In lieu of the A.M. Best Company Rating, insures rated AAA, AA+, AA, AA- by Standard & Poor's Insurance Rating Services will also be acceptable.

34. OPE**RATION OF EXISTING FACILITIES:** The Contractor shall not interrupt the operation of the existing water treatment facility. During the course of the work should an interruption become absolutely necessary, the contractor shall notify and coordinate with the Owner and the OWNER'S REPRESENTATIVE at least 72 hours in advance to minimize disruption of service. The Contractor shall cooperate fully with the Owner in minimizing interruption of operations.

Contractor shall notify and coordinate with the Owner and the OWNER'S REPRESENTATIVE at least 72 hours in advance to minimize disruption of service. The Contractor shall cooperate fully with the Owner in minimizing interruption of operations.

35. **RESIDENT OWNER'S REPRESENTATIVE OFFICE:** Contractor shall provide adequate dedicated office space within the construction site for the sole use of the OWNER'S REPRESENTATIVE and the PROJECT ARCHITECT. This space requires power, HVAC, sanitary facilities (shared), and internet service.

36. **PERMITS:** The Contractor shall secure and pay for all necessary construction related permits with the City of Forest Park and required for completion of the work.

37. **STATED ALLOWANCES:** The following allowances shall be included in the Base Bid Proposal of the Contractor:

1) Contingency Funds Bidder is to include a "Construction Contingency Allowance" amount equal to five percent (5%) of the "Lump Sum Base Bid Amount" within the "Lump Sum Base Bid" the amount bid on the Bid Form submitted. This allowance is for additional work as directed by the Owner. Monies not utilized by the Owner for this project will be removed from the final contract price at the completion of the project by use of a Change Order

38. ARTICLE 15: SUSPENSION OF WORK AND TERMINATION:
Termination by the Owner for Cause: Add the following subparagraphs 15.5.1 and 15.5.2 to the General Conditions.

15.5.1: "If the Owner has terminated the Contract as provided in Paragraph 15.02 and if it is subsequently determined for any reason that the Owner was not authorized to terminate the Contract

as provided in said Paragraph, the rights and obligations of the parties shall be the same as if the Owner has issued a Notice of Termination to the Contractor as provided in Paragraph 15.5.2 hereinbelow."

15.5.2: "(a) The Owner may, at any time, terminate, in whole or in part, the Work under this Contract for the Owner's convenience and without cause. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective;

(b) After Receipt of a Notice or Termination, and except as otherwise directed by the Owner, the Contractor shall:

1) Stop work under the Contract on the date and to the extent specified in the Notice of Termination;

2) Place no further orders or subcontracts for materials, services or facilities except as necessary to complete the portion of the Work under the Contract which is not terminated;

3) Terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by the Notice of Termination;

4) Assign to the Owner, in the manner, at times, and to the extent directed by the Owner, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated. The Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

5) Settle all outstanding liabilities and all Claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner to the extent the Owner may require. Its approval or ratification shall be final for all the purposes of this Paragraph 15.5.2;

6) Transfer title to the Owner, and deliver in the manner, at the times, and to the extent, if any, directed by the Owner, (i) the fabricated or unfabricated parts, Work in progress, completed Work, supplies, and other material produced as a part of, or acquired in connection with the performance of the Work terminated by the Notice of Termination, and (ii) the completed or partially completed plans, drawings, information, and other property which, if the Contract had been completed, would have been required to be furnished to the Owner;

7) Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices that the Owner directs or authorizes, and property of the types referred to in Subparagraph (b) (6) of this Paragraph, but the Contractor (i) shall not be required to extend credit to any purchaser, and (ii) may acquire any such property under the conditions prescribed and at a price or prices approved by the Owner. The proceeds of any such transfer or deposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under this

Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Owner may direct;

8) Complete performance of such part of the Work as shall not have been terminated by the Notice of Termination; and,

9) Take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to this Contract which is in the possession f the Contractor and in which the Owner has or may acquire an interest;

c) After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination claim, in the form and with the certification the Owner prescribes. Such claims shall be submitted promptly but in no event later than one (1) year from the effective date of termination, unless one or more extensions in writing are granted by the

Owner upon request of the Contractor made in writing within such one (1) year period or authorized extension However, if the Owner determines that the facts justify such action, it may receive and act upon any such termination claim at any time after such one (1) year period or extension. If the Contractor fails to submit his termination claim within the time allowed, if any, due to the Contractor because of the termination. The Owner shall then pay to the Contractor the amount so determined.
d) Subject to the provisions of paragraph c), the Contractor and the owner may agree upon the whole or any part of the amount or amount to be paid to the Contractor because of the total or partial termination of Work under paragraph 15.5.2. The amount or amounts may include a reasonable allowance for profit on Work done. However, such agreed amount or amounts, exclusive of settlement costs, shall not exceed the Contract Sum as reduced by the amount of payments otherwise made and as further reduced by the Contract price of work not terminated. The Contract shall be amended accordingly, and the Contactor shall be paid the agreed amount. Nothing in paragraph (e) of this Paragraph 15.5.2, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Owner to agree upon the whole amount to be paid to the Contractor because of the termination of Work under this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount of amounts which may be agreed upon to be paid to the Contractor pursuant to this Subparagraph (d);
(e) If the Contractor and the Owner fail to agree as a paragraph (d) provides, on the whole amount to be paid to the Contractor because of the termination of Work under this Paragraph 15.5.2, the Owner shall determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amounts determined as follows:

1. For all Work performed before the effective date of the Notice of Termination, the total (without duplication of any items) of:

i) The cost of such Work;

ii) The cost of settling and paying claims arising out of the termination of Work under subcontracts or others as Paragraph 15.5.1 provides. This cost is exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the

subcontractor before the effective date of the Notice of Termination. These amounts shall be included in the cost on account of which payment is made under (i) above; and

iii) A sum, as profits on (i), above; that the Owner determines to be fair and reasonable. But, if it appears that the Contractor would be sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this subdivision (iii) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss.

1) The reasonable cost of the preservation and protection of property incurred under paragraph (b) (9) of this Paragraph 15.5.2; and any other reasonable cost identical to termination of Work under this Contract, including expense incidental to the determination of the amount due to the Contractor as a result of the termination of Work under this Contract. The total sum of this Paragraph 15.5.2. shall not exceed the total Contract Sum as reduced by the amount of payments otherwise made and as further reduced by the Contract Price of Work not terminated. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amount payable to the Contractor under (1) above, the fair value, as determined by the Owner of property which is destroyed, lost, stolen, or damaged, to the extent that it is undeliverable to the Owner, or to a buyer under Subparagraph (b) (7) of this Paragraph 15.5.2;

(f) The Contractor shall have the right to make claim from any determination the Owner makes under paragraph (c) or (e) of this Paragraph 15.5.2. But, if the Contractor has failed to submit his claim within the time provided in paragraph (c) of this Paragraph 15.5.2 and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Owner has determined the amount due under Subparagraph (c) or (e) of this Paragraph 15.5.2, the Owner shall pay to the Contractor the following: (1) the amount so determined by the owner or (2) if an adverse proceeding is initiated, the amount finally determined in such proceeding;
(g) In arriving at the amount due the Contractor under this Paragraph 15.5.2, there shall be deducted (1) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the termination portion of this Contract, (2) any claim which the Owner may have against the Contractor in connection with this Contract, and (3) the agreed price for, or the proceeds of sale of, any materials, supplies or other things kept by the Contractor or sold, under the provisions of this Paragraph 15.5.2, and not otherwise recovered by or credited to the Owner;
(h) If the termination hereunder be partial, before the settlement of the termination portion of this Contract, the Contractor may file with the Owner a request in writing for an equitable adjustment of the price or prices specified in the Contract related to the continued portion of the Contract (the portion not terminated by the Notice of Termination). Such equitable adjustments as may be agreed upon shall be made in the price or prices. Nothing contained herein shall limit the right of the Owner and the Contractor to agree upon the amount or amounts to be paid to the Contractor for the completion of the continued portion of the Contract when the Contract does not contain an established contract price for the continued portion."

39. <u>ADDITION OF TECHNICAL SPECIFICATIONS:</u>

SECTION XV

a. Technical Specifications, in addition to those included in the Contract Documents, that will be utilized for use with the "City of Forest Park, GA – Gillem Public Safety Building" project shall be per the "Georgia Department of Transportation – Standard Specifications Construction of Transportation Systems – January 21, 2021 or latest revision" (Note: Local Standards take precedence over GDOT specifications related to conflicting guidelines, plans, and/or specifications related to roadways that have local jurisdiction.)
b. Technical Specifications, in addition to those included in the Contract Documents, that will be utilized for use with the "City of Forest Park, GA – Gillem Public Safety Building" project shall be per the "Manual on Uniform Traffic Control Devices for Streets and Highways – 2009 MUTCD with Revisions 1 and 2, May 2012 or latest revision"
c. Technical Specifications, in addition to those included in the Contract Documents, that will be utilized for use with the "City of Forest Park, GA – Gillem Public Safety Building" project shall be per the "Georgia Soil and Water Conservation Commission - Manual for Erosion and Sediment Control in Georgia – 2016 Edition or latest revision"

SECTION XVI

GEOTECHNICAL TEST REPORT

July 2, 2021

Sent via email
aprice@fdc-llc.com

Mr. Adam Price, P.E.
Falcon Design Consultants, LLC
235 Corporate Center Dr., Suite 200
Stockbridge, GA 30281

Subject: **Report of Geotechnical Exploration**
Forest Park Gillem Public Safety Facility
Hood Avenue
Forest Park, GA 30294
2MNEXT Project No.: 21G3006

Dear Mr. Price:

In accordance with your request and authorization of Materials Managers and Engineers, Inc. (2MNEXT) Proposal No. P21-42 dated June 22,2021, we have conducted a Geotechnical Engineering Exploration for the proposed Forest Park Gillem Public Safety Facility in Forest Park, Georgia. The conclusions and recommendations that we developed from the exploration are discussed in the accompanying report.

We appreciate the opportunity to have been of service on this project. Please call us if you have any questions or if we may be of further service.

Sincerely,

Materials Managers and Engineers, Inc. (2MNEXT)

Daimia T. Gunning, P.E.
Principal Engineer

Ali Razavi, P.E.
Project Engineer

Table of Contents

Attachments:
Figure 1: Site Location Map
Figure 2: Boring Location Plan
Boring Logs

1. INTRODUCTION

1.1 Site and Project Information

We understand the proposed 13,477 square feet Forest Park Gillem Public Safety Facility will be located at the existing undeveloped lot located at the intersection of the former N 3rd Street and current Hood Avenue, in Forest Park, Georgia. The building will straddle the former N 3rd Street, on the northside of Hood Avenue/Anvil Block Rd. At the time of this report, no structural or grading plans were provided to 2MNEXT. Based on our experience with similar construction, we anticipate column loads will be around 150 kips and wall loads will be about 3klf. The site of our exploration is relatively level, so we anticipate grading will be limited to creating a level building pad and to promoting positive drainage at the site.

1.2 Purpose of Site Investigation

The objective of this exploration was to determine the subsurface conditions within the area of the proposed building, driveways, parking areas and green space located at west end of property.

2. EXPLORATION PROCEDURES

2.1 Field Exploration

During this exploration, seven (7) Standard Penetration Test (SPT) borings (designated B-1 to B-5, B-1A and B-5A) were drilled approximate locations shown on Figure 2: Boring Location Plan. The borings were drilled to depths ranging from 5 to 25 feet below ground surface elevation. Borings B-1 and B-5 encountered shallow auger refusal at 5 and 8 feet below existing ground surface, respectively, and offset borings B-1A and B5A were performed to verify refusal.

Drilling, soil sampling, and standard penetration testing were performed in general accordance with ASTM Standard D 1586. The borings were advanced by mechanically twisting hollow stem augers into the soil. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split barrel sampler. The sampler was first seated 6 inches and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the final foot was recorded and is designated the “standard penetration resistance” (N-values). Penetration resistance, when properly evaluated, is an index of the soil's strength, density and foundation support capability.

The Test Boring Records in the Appendix show the standard penetration test (SPT) resistances, or “N-values”, and present the soil conditions encountered in the boring. These records represent our interpretation of the subsurface conditions based on the field exploration data and visual examination of the split-barrel samples, consistent with generally accepted geotechnical engineering practices. The stratification lines and depth designations represent approximate boundaries between various subsurface strata. Actual transitions between materials may be gradual. The groundwater levels reported on the Test Boring Records represent

measurements made at the completion of the soil test borings. The soil test borings were subsequently backfilled with the soil cuttings. Samples will be discarded 30 days after submission of this report.

3. SITE AND SUBSURFACE CONDITIONS

3.1 Area and Site Geology

The project site is in the Piedmont Geologic Region, an area underlain by igneous and metamorphic rocks. The in-place chemical and physical weathering of the parent rock material has formed the residual soils present in this geologic area. Weathering is facilitated by fractures, joints, and seams of less resistant minerology. The typical residual soil profile consists of fine grained (silty) soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands that generally become denser/harder with depth to the top of bedrock.

The boundary between soil and rock is typically not sharply defined. A transitional zone termed "partially weathered rock" (PWR) is frequently encountered above unweathered bedrock. PWR is defined for engineering purposes as residual material that can be penetrated with soil drilling tools, but which produces a standard penetration resistance (N60) greater than 100 blows per foot (bpf). The upper surface of PWR and sound, massive bedrock can vary over short horizontal distances. Lenses and boulders of rock and PWR may be present within the soil above the elevation of the mass of PWR.

Published geologic maps (Geology of the Greater Atlanta Region, by Keith I. McConnell and Charlotte E. Abrams, 1984) indicate the site is underlain by the Soapstone Ridge Formation which is characterized by Schist and amphibolite.

3.2 Subsurface Conditions

Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Below the ground surface, the borings encountered fill soils, residual soils and boulders. These strata are discussed in the following paragraphs and in the boring log in the Appendix.

3.2.1 Surface Material

Borings B-1, B-2, B-4 and B-5 encountered 2 to 3 inches of topsoil. Boring B-3 encountered 2 inches of asphalt and 8 inches of graded aggregate base (GAB).

3.2.2 Fill

Fill soils are transported to a site from elsewhere for grading purposes to raise existing site grades. Sometimes fill soils are transported, placed, and compacted under an appropriate quality control testing and

inspection program; this fill is known as “controlled fill”. When the fill is placed without proper control, it may contain deleterious materials or may not have been compacted which makes it unsuitable for foundation support purposes; this type of fill is known as “uncontrolled” fill.

At this project site, fill material classified as loose to medium dense silty sand was encountered below the topsoil and pavement surface materials. The SPT N-values in the fill ranged from 8 bpf to 21 bpf.

3.2.3 Residual Soils

Residual soils are formed by in-place weathering of parent rocks and are characterized by relic rock structure and no apparent sign of organics, debris or other deleterious materials in the soil samples. At this site, residual soils were generally classified as loose to dense silty sand (SM). The SPT N-values ranged from 5 bpf to 48 bpf.

3.2.4 Auger Refusal Materials

Auger refusal materials are any very hard or very dense material, frequently boulders or the upper surface of bedrock, which cannot be penetrated by the soil drilling process. Borings B-1 and B-5 encountered auger refusal at depths of 5 to 8 feet below existing ground surface. Offset borings were advance well beyond the refusal materials, suggesting boulders or rock lenses with the soil profile. Auger refusal was also encountered in Boring B-5A at 21 feet below ground surface and could be the surface of bedrock.

3.2.5 Groundwater

Groundwater was not encountered in any of the borings at the time of drilling; however, wet soils were encountered in borings B-2 and B-4 near boring termination depths. The borings were backfilled at end of the day therefore, stabilized groundwater was not measured. A fluctuation in the water table or the development of perched water levels at shallower depths in more permeable zones within the soils or within the debris containing fill may occur seasonally, depending upon the amounts of precipitation and water runoff to the site.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 General

The following conclusions and recommendations are based on our observations at the site, interpretation of the field data obtained during this exploration, and our experience with similar subsurface conditions. Subsurface conditions in unexplored locations may vary somewhat from those encountered. These design recommendations are based on available information related to structure location, magnitude of loads and estimate of finish floor elevation. If this information is changed, we request that we be advised so that we may re-evaluate our recommendations.

The site is underlain by up to approximately 2 to 3 feet existing fill of variable quality and compressibility. We are unaware of any records of quality control during fill placement and as such consider the existing fill to be uncontrolled. Uncontrolled fill carries some risk associated with support of buildings and structures if left in place. The uncontrolled fill should be considered suspect and may not be acceptable in its present state for support of new fill and pavements. Some undercutting and recompaction should be anticipated prior to support of structures and pavements.

4.2 Soil Bearing Capacity

We assume that the column loads for the building will be less than 150 kips. We recommend the proposed building be supported by conventional shallow spread foundations. Foundations bearing on undisturbed residual soils and structural fill may be designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). We recommend widths be not less than 24 inches for footings for ease of construction and to eliminate the possibility of localized shear failures. Footing bottoms should be at least 18 inches below exterior grades for protection against frost damage. At the recommended bearing pressure, total settlement should be less than 1 inch and differential settlement between adjacent columns should be less than 1/2 inch.

Uncontrolled fill was encountered at all borings to depths of ranging from 2 to 3 feet below existing ground surface. Existing fill is of concern due to uncertainty as to possible buried debris, poor compaction, or other issue with the subgrade.

Based on this interpretation of existing fill soils, we anticipate a need for removal and replacement of the fill in the building footprint. Compaction testing described in Structural Fill section and other routine testing and controls at the time of construction, such as thorough proof-rolling will be needed for replacement of fill.

4.3 Difficult Excavation

As noted, borings B-1 and B-5 encountered auger refusals materials at depths of 5 to 8 feet below existing ground surface. Dense soils were also encountered in the upper 10 feet of subgrade at borings B-1A and B-2. Therefore, we anticipate that some difficult excavation may be required at the site, near the bottom of foundation and at underground utility trench locations.

Dense soils and PWR can typically be ripped in open excavation by powerful backhoes (CAT 325 or similar) taking advantage of joints, fissures, and other natural weaknesses in the rock. In confined location, like footing and utility trench excavations, pneumatic tools, non-explosive demolition products, or blasting may be required to excavate PWR. Sound massive rock will typically require blasting.

Rock and PWR will tend to break along planes of weakness which are unlikely to be regular or oriented favorably with the excavation. As such, some over excavation should be anticipated.

Costs of rock excavation (by blasting or other measures) are high compared to ripping or other excavation. Therefore, we recommend that ripping be attempted on all rock and all overlying materials be removed prior to resorting to blasting. This will allow detailed surveying of the rock surface and quantification of the rock volume. Blast mats or loose soil may be placed over the exposed rock to aid in control of the blasting. Drilling and blasting through in-place overburden typically requires greater charges due to the

increased confinement and can result in greater vibrations and larger "rock" quantities as materials that may have been ripped get included in the blast rock volume. Following blasting, disturbed materials should be removed from the excavation.

The following rock excavation definitions have been incorporated into specifications on other projects:

Blast Rock - Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 325 or equivalent) and occupying an original volume of at least one-half (½) cubic yard..

4.4 Retaining Wall

We anticipate that a short retaining wall, with height less than 5 feet, may be required at this site for a loading dock. The most common conditions assumed for earth retaining wall design are the active and at-rest conditions. Active conditions apply to relatively flexible earth retention structures, such as freestanding walls, where some movement and rotation may occur to mobilize the soil's shear strength. Rigidly restrained walls should be designed for the at-rest condition. Based on the restraint conditions, the loading dock wall may need to be designed for an intermediate pressure.

Based on our experience with similar soils and construction, we recommend the values in the table below for earth pressure design and the resulting equivalent fluid unit weights.

Table 1. Recommended Lateral Earth Pressures

Earth Pressure Conditions	Lateral Earth Pressure Coefficient	Recommended equivalent Fluid Unit Weight (pcf)
Active (K_a)	0.33	40
At-rest (K_o)	0.50	60
Passive (K_p)	2.80	150*

***The total calculated passive pressure has been reduced for design purposes because significant wall movements are required to mobilize full passive pressure.**

Our recommendations assume that the ground surface above and below the wall is level and that soils like those found in our borings will be used for structural wall backfill. The recommended equivalent fluid pressures assume that constantly functioning drainage systems are installed between wall and soil backfill, to prevent the build-up of hydrostatic pressures and lateral stresses in excess of those stated.

Heavy construction equipment should not operate within 5 feet of the wall to prevent lateral pressures in excess of those cited. If footings or other surcharge loadings are located a short distance outside below grade walls, they may also exert appreciable additional lateral pressures. If an imaginary line projected downward at a 45-degree angle from the bottom near edge of the surcharge load does not intersect the wall, the effect of the load on the wall may be neglected. If the line intersects the wall, the effect of the surcharge

loads should be added to the recommended earth pressures to determine total lateral stresses. Foundation bearing levels may also be lowered to eliminate increased stresses on adjacent retaining wall.

4.5 Slab-on-grade Recommendations

A slab on prepared subgrade consisting of controlled fill or residual soil may be designed for a modulus of subgrade reaction, ks, of 100 pounds per cubic inch. The slab should be isolated from column and wall foundations to reduce the risk of cracking because of the differential loading. To reduce differential stresses and potential cracking, we recommend 6 inches graded aggregate base (GAB) be placed beneath the slab. We recommend a minimum compaction of 100 percent of the maximum dry density for the GAB as determined by the modified Proctor compaction test, ASTM D 1557.

4.6 Pavement Recommendations

We recommend a minimum asphalt pavement section comprised of 3 inches of asphalt surface course above 6 inches of graded aggregate base for new pavements. This minimum section is based on traffic primarily composed of automobiles with an occasional light truck. For areas with more than occasional truck traffic, we recommend a minimum asphalt pavement section comprised of 4 inches of asphalt surface course above 8 inches of graded aggregate base. If heavier or more frequent truck traffic is anticipated, the section should be designed based on the anticipated traffic and California Bearing Ratio (see below).

A concrete dumpster pad of 8 inches of 4,000 psi concrete over 4 inches of GAB for drainage is recommended to support dumpsters and the front wheels of garbage trucks. Concrete paving is also recommended in loading docks or where heavy vehicles will maneuver.

Pavement life and performance will depend on a uniform, well-drained subgrade. The silty soils, when prepared by proofrolling and compaction as outlined in this report, should provide a California Bearing Ratio (CBR) value of about 5. The soils will be sensitive to moisture, so the pavement and subgrade should be sloped to drain and the pavement section should include a layer of GAB. GAB should be provided with outlets at the edges of the pavement to prevent accumulation of water in the GAB and resulting saturation of the subgrade. Long-term saturation of the GAB will result in saturation and weakening of the subgrade. Transitions between pavement thicknesses should be gradual to avoid cracking at the changes. Timely repair of minor cracking, depressions, or potholes will protect subgrade and provide the greatest pavement life.

4.7 Seismic Design Consideration

In accordance with Section 1613 of the 2018 IBC, the seismic Site Class was estimated based on the standard penetration resistance values obtained from the soil test borings performed during this study and our knowledge of general subsurface conditions in the area. We recommend a site class of D be used for design of this project.

.

5. CONSTRUCTION RECOMMENDATIONS

5.1 Site and Subgrade Preparation

All existing construction (pavements, utilities, and concrete retaining wall, etc.) should be removed from the construction area to expose residual soil relatively free of roots, debris, and other deleterious material. Broken concrete, asphalt, and construction debris should generally be hauled to an appropriate off-site disposal facility.

5.2 Structural Fill

Based on existing grades, we anticipate fills to achieve planned grades will be less than 5 feet. The on-site soils may be reused for structural fill. Any engineered fill soil used at the site must be free of organic matter or debris, rock fragments greater than 3-inches in diameter, have a low to moderate plasticity (PI less than 30) and have a maximum dry density of at least 95 pounds per cubic foot (pcf) as determined by Standard Proctor (ASTM D 698).

Any new fill should be placed in lifts and compacted by suitable compaction equipment. It is recommended that uniform lifts with a maximum loose thickness of 8-inches be used for engineered fill soil placement. In confined areas, such as utility trenches, where large compaction equipment cannot be used, a thinner lift (4-inches loose thickness) may be required to achieve the required level of compaction. The engineered fill must be placed by mechanically compacting each horizontal lift of fill material to a minimum dry density corresponding to 95 percent of the Standard Proctor (ASTM D 698) maximum dry density.

The upper 12 inches of new fill beneath the new pavement, should be compacted to at least 98 percent of the Standard Proctor (ASTM D 698) maximum dry density at a moisture content equal to the optimum moisture content plus or minus 3 percent. In cut areas, the upper 12 inches should be scarified and similarly recompacted.

During wet/rainy periods, aeration of the fill soil may be necessary to adjust the materials to the required moisture condition. During dry periods, water may need to be added to achieve the required moisture condition for proper compaction. During extreme wet weather events, other options that can be used for "drying" and stabilizing "wet" fill soils include mixing the soils with cement or lime. The effectiveness of lime or cement in drying and stabilizing wet soils should be evaluated by the geotechnical engineer prior to their use.

6. LIMITATIONS

Our evaluation of foundation design and construction conditions has been based on our understanding of the site and project information and the data obtained during our field exploration. The general subsurface conditions used were based on interpolation of the subsurface data between the borings. The design recommendations in this report have been developed on the basis of the previously described project characteristics and subsurface conditions.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after on-site observations of the conditions. Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations; that conditions are not as anticipated by the designers; or that the construction process has altered the soil conditions. Therefore, an experienced geotechnical engineer should observe earthwork and foundation construction to verify that the conditions anticipated in design exist.

FIGURE 1 Site Location Map	Forest Park Gillem Public Safety Facility 2MNEXT Project Number: 21G3006	Falcon Design Consultants, LLC	Not to Scale	Reference: Google Maps

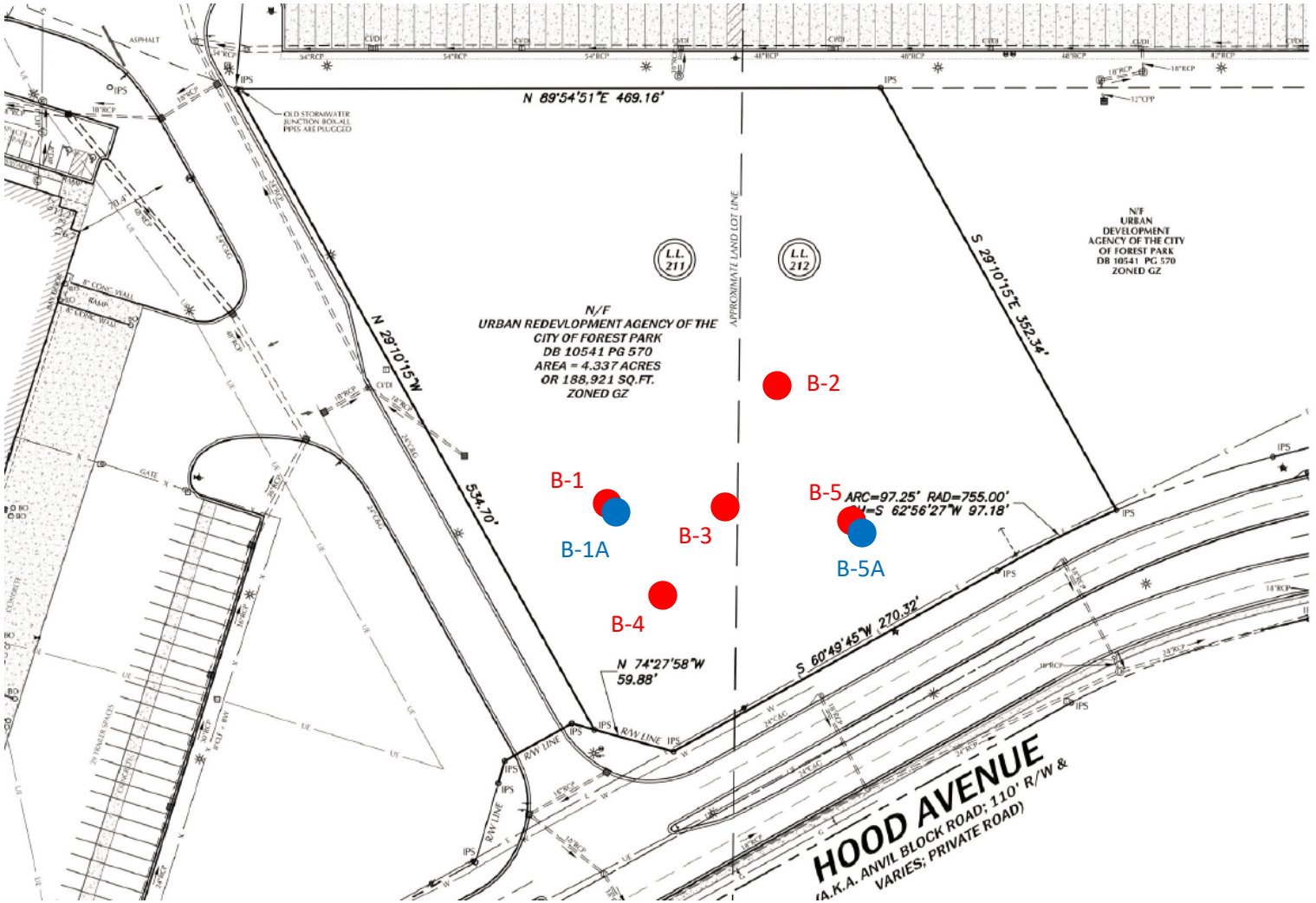


FIGURE 2 BORING LOCATION PLAN	Forest Park Gillem Public Safety Facility 2MNEXT Project Number: 21G3006	Client: Falcon Design Consultants, LLC	Not to Scale	Reference: Boundary Survey Plan Dated 04/02/21 by Valentino and Associates, Inc.	Legend: Approx. Location of Borings: B-#

BORING NUMBER B-1

2MNEXT®

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
	0		3" Topsoil						
			(SM) (FILL) SILTY SAND, reddish brown, moist, loose	SPT 1		3-5-5 (10)			
			(SM) (RESIDUUM) SILTY SAND, contains rock fragments, gray and tan, moist, medium dense	SPT 2		9-7-7 (14)			
	5								

Auger Refusal at 5 feet.

2MNEXT®

BORING NUMBER B-1A

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		Offset to 5 ft south of B-1 - Straight Auger to depth of 5 ft					
	5		(SM) (RESIDUUM) SILTY SAND, contains rock fragments, gray and tan, moist, dense	SPT 1		10-26-9 (35)		
			(SM) - loose	SPT 2		4-4-4 (8)		
	10							
			(SM) - medium dense	SPT 3		16-7-10 (17)		
	15							
			(SM) - loose	SPT 4		3-4-4 (8)		
	20							
				SPT 5		2-3-4 (7)		
	25							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Boring Terminated at 25 feet.

2MNEXT®

BORING NUMBER B-2

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		3" Topsoil					
			(SM) (FILL) SILTY SAND, reddish brown, moist, medium dense	SPT 1		4-7-7 (14)		
			(SM) (RESIDUUM) SILTY SAND, dark brown and gray, moist, dense	SPT 2		21-27-17 (44)		
	5							
			(SM) - medium dense	SPT 3		8-12-10 (22)		
				SPT 4		7-8-9 (17)		
	10							
				SPT 5		6-8-11 (19)		
	15							
			(SM) - loose	SPT 6		3-4-4 (8)		
	20							
			(SM) - wet, medium dense	SPT 7		6-7-10 (17)		
	25							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Boring Terminated at 25 feet.

BORING NUMBER B-3

2MNEXT®

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		2" Asphalt Approximately 8" Graded Aggregate Base (GAB) (SM) (FILL) SILTY SAND, reddish brown, moist, loose	SPT 1		14-4-4 (8)		
			(SM) (RESIDUUM) SILTY SAND, contains mica, reddish brown, moist, loose	SPT 2		5-5-5 (10)		
	5			SPT 3		3-4-5 (9)		
				SPT 4		4-4-5 (9)		
	10							
			(SM) - tan and gray, medium dense	SPT 5		6-7-9 (16)		
	15							
			(SM) - loose	SPT 6		2-2-3 (5)		
	20							
			(SM) - medium dense	SPT 7		3-5-7 (12)		
	25							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Boring Terminated at 25 feet.

BORING NUMBER B-4

2MNEXT®

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		3" Topsoil					
			(FILL) SILTY SAND, reddish brown, moist, medium dense	SPT 1		7-10-11 (21)		
			(SM) (RESIDUAL) SILTY SAND, tannish brown and gray, moist, medium dense	SPT 2		5-8-8 (16)		
	5			SPT 3		4-5-7 (12)		
				SPT 4		4-9-8 (17)		
	10							
				SPT 5		5-6-7 (13)		
	15							
			(SM) - gray, wet, loose	SPT 6		4-3-4 (7)		
	20							
				SPT 7		2-2-3 (5)		
	25							

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Boring Terminated at 25 feet.

BORING NUMBER B-5

2MNEXT®

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION _____ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		3" Topsoil (SM) (FILL) SILTY SAND, reddish brown, moist, loose	SPT 1		4-6-8 (14)		
			(SM) (RESIDUUM) SILTY SAND, contains rock fragments, gray and tan, moist, medium dense to dense	SPT 2		5-7-7 (14)		
	5			SPT 3		10-28-20 (48)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Auger Refusal at 8 feet.

2MNEXT®

BORING NUMBER B-5A

CLIENT Falcon Design Consultants, LLC
PROJECT NAME Forest Park Gillem Public Safety Facility
PROJECT NUMBER 21G3006
PROJECT LOCATION Forest Park, GA
DATE STARTED 7/1/21 **COMPLETED** 7/1/21
GROUND ELEVATION ___ **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Betts Environmental
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Auto Hammer)
AT TIME OF DRILLING --- No groundwater encountered.
LOGGED BY AR **CHECKED BY** DG
AT END OF DRILLING ---
NOTES
AFTER DRILLING --- Boring was backfilled at the end of drilling.

ELEV. (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
	0		Offset to 10 ft south of B-5 - Straight Auger to depth of 8 ft					
	10		(SM) (RESIDUUM) SILTY SAND, contains rock fragments, gray and tan, moist, medium dense	SPT 1		7-12-17 (29)		
	15		(SM) - loose	SPT 2		2-3-5 (8)		
	20		(SM) - medium dense	SPT 3		7-8-9 (17)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Auger Refusal at 21 feet.

SECTION XVII

FORM 5

REFERENCE VERIFICATION AND RELEASE FORM

SOLICITATION NUMBER: ITB NO.: 12012021

PROJECT TITLE: FOREST PARK – GILLEM PUBLIC SAFETY BUILDING

BIDDER: _____
(List name exactly as provided in Bid Form)

Provide at least five (5) references for the Bidder listed above of work similar to the current project being completed within the last ten (10) years. Provide the information requested in the form below for the contact person who will verify the Bidder's experience and ability to perform the type of services listed in the ITB.

REFERENCE NO. 1:

Name of Company/Entity: _____

Mailing Address: _____

City/State/Zip Code: _____

Contact Person Name: _____

Contact Person Title: _____

Contract Person Phone No.: _____

Contract Person Email: _____

Date Work Performed: _____

Brief Description of Work Performed: _____

_____

_____

SECTION XVII

REFERENCE NO. 2:

Name of Company/Entity:

Mailing Address:

City/State/Zip Code:

Contact Person Name:

Contact Person Title:

Contract Person Phone No.:

Contract Person Email:

Date Work Performed:

Brief Description of Work Performed:

REFERENCE NO. 3:

Name of Company/Entity:

Mailing Address:

City/State/Zip Code:

Contact Person Name:

Contact Person Title:

Contract Person Phone No.:

Contract Person Email:

Date Work Performed:

Brief Description of Work Performed:

SECTION XVII

REFERENCE NO. 4:

Name of Company/Entity:

Mailing Address:

City/State/Zip Code:

Contact Person Name:

Contact Person Title:

Contract Person Phone No.:

Contract Person Email:

Date Work Performed:

Brief Description of Work Performed:

REFERENCE NO. 5:

Name of Company/Entity:

Mailing Address:

City/State/Zip Code:

Contact Person Name:

Contact Person Title:

Contract Person Phone No.:

Contract Person Email:

Date Work Performed:

Brief Description of Work Performed:

SECTION XVII

REFERENCE VERIFICATION RELEASE STATEMENT

The Bidder listed below hereby authorizes the City of Forest Park and its Representatives to contact the references provided for this bid and any additional parties that may be encountered/discovered during the reference conformation process.

BIDDER:_____
(List name exactly as provided in Bid Form)

SIGNED BY: _____
(Printed name and title)

AUTHORIZED SIGNATURE:_____ **DATE:**_____

PART II – TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION TITLES **PAGES**

SECTION TITLES **PAGES**

SECTION TITLES **PAGES**

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other Work of this Contract.

D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

Alternate No. 1 – Provide Overhead Sectional Doors in Lieu of Four-Fold Folding Doors at Apparatus Bay:
Provide a **deductive alternate** to provide overhead sectional doors complying with Specification Section 08 33 23 Sectional Overhead Doors at openings 139E, 139F and 139G in lieu of Four-Fold Door Systems. The General Contractor and sectional door subcontractor shall be responsible for the coordination and construction of said doors to meet all dimensional, power, controls, finish and manufacturer's requirements as specified in the Construction Documents for sectional overhead doors.

Alternate No. 2 – Omit Plymovent Exhaust Extraction System:
Provide a **deductive alternate** to omit the safe air corporation exhaust system as indicated on sheet M2.0 in its entirety including but not limited to all associated power distribution, controls, equipment, mounting hardware, fans and roof penetrations. All mechanical supply and exhaust fans (SF-1 thru SF-4 and EF-1 thru EF-4) and associated controls for the apparatus bay as indicated on sheets M2.1 and M2.2 shall remain in contract as these systems have been designed to accommodate the required air change over rates for this space.

Alternate No. 3 – Omit all site lighting:
Provide a **deductive alternate** to omit all S2 site lighting pole fixtures from Contractor's scope of work. All pole bases, raceways and junction boxes for installation of fixtures shall remain in Contractor's scope. Installation of all S2 fixtures, cabling, terminations and start-up shall be provided by Power Company.

Alternate No. 4 – Omit all FF&E and Food Service Equipment:
Provide a **deductive alternate** to omit all FF&E and Food Service equipment as indicated in the specification sections indicated below. All other scope of work indicated in Divisions 10, 11 and 12 shall remain in the Contractor's scope of work.

- Section 11 40 00 FOOD SERVICE EQUIPMENT
- Section 12 40 00 FIXTURES, FURNISHINGS AND EQUIPMENT

Alternate No. 5 – Provide Fiber-Cement Cladding System in Lieu of Composite Metal Panel System:
Provide a **deductive alternate** to provide Fiber Cement Architectural Wall Panels in lieu of composite metal panel system as indicated on sheets A5.1, A6.2, A6.3, A6.4 and specified in section 07 42 43 COMPOSITE METAL PANELS. Fiber Cement Architectural Wall Panels shall be included in deductive alternate as specified below. The General Contractor and fiber cement wall panel subcontractor shall be responsible for the coordination and construction of said panels to meet all dimensional, trim, flashing, finish and manufacturer's requirements as specified below. Contractor shall provide all product data, shop drawings and sample submittals for fiber cement wall panel systems to Architect for review prior to installation.

- Manufacturer: Nichiha Architectural Wall Panels, 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097
- Product: Stock Illumination Designer Series
- Panel Thickness: 5/8"
- Finish: Smooth Semigloss
- Color: As selected by Architect from manufacturer's full range of stock colors
- Warranty: 15 year material / 15 year finish

Alternate No. 6 – Omit all Stainless Steel Corner Guards:
Provide a **deductive alternate** to omit all corner guards as indicated in Specification Section 10 26 13 CORNER GUARDS from Contractor's scope of work.

Alternate No. 7 – Omit Lightning Protection System:

Provide a **deductive alternate** to omit lightning protection system in its entirety as indicated in Specification Section 26 41 13 LIGHTNING PROTECTION SYSTEM from Contractor's scope of work.

END OF SECTION 01 23 00

SECTION 01 29 00
APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
   a. Contractor's Construction Schedule.
   b. Application for Payment forms, including Continuation Sheets.
   c. List of subcontractors.
   d. Schedule of allowances.
   e. Schedule of alternates.
   f. List of products.
   g. List of principal suppliers and fabricators.
   h. Schedule of submittals.
2. Submit the Schedule of Values to the Architect at the earliest possible date but no later than seven (7) days before the date scheduled for submittal of the initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location.
   b. Name of the Architect.
   c. Architect’s project number.
   d. Contractor's name and address.
   e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of Work.
   c. Dollar value.

1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
4. **Round amounts to nearest whole dollar**; the total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
   a. Only items stored on-site will be allowed to bill.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

1. **The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.**

B. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.

D. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action. Corrections shall be made in original form prior to certification.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to the Architect by a method ensuring receipt within 24 hours. All copies shall be complete, including waivers of lien and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application.

F. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

G. **Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:**

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule.
5. Submittal Schedule.
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from governing authorities for performance of the Work.
10. Initial progress report.

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include:
   a. Occupancy permits and similar approvals.
   b. Warranties (guarantees) and maintenance agreements.
   c. Test/adjust/balance records.
   d. Maintenance instructions.
   e. Meter readings.
   f. Startup performance reports.
   g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
   h. Final cleaning.
   i. Application for reduction of retainage and consent of surety.
   j. Advice on shifting insurance coverages.
   k. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

I. **Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:**

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims will be settled.
4. Certified property survey.
5. Proof that taxes, fees, and similar obligations were paid.

6. **Removal of temporary facilities and services.**
7. **Removal of surplus materials, rubbish, and similar elements.**
8. **Change of door locks to Owner's access.**

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01 29 00

SECTION 01 31 19
PROGRESS MEETINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Preinstallation conferences.
3. Progress meetings.
4. Coordination meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Project Coordination” for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section “Submittals” for submitting the Contractor's Construction Schedule.
3. Division 8 Sections “Steel Doors and Frames, Flush Wood Doors, Door Hardware and Glazing” for submittal review meetings.

1.3 PRECONSTRUCTION CONFERENCE

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data, and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Parking availability.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.

13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

1.4 PREINSTALLATION CONFERENCES

A. Conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   d. Purchases.
   e. Deliveries.
   f. Shop Drawings, Product Data, and quality-control samples.
   g. Review of mockups.
   h. Possible conflicts.
   i. Compatibility problems.
   j. Time schedules.
   k. Weather limitations.
   l. Manufacturer's recommendations.
   m. Warranty requirements.
   n. Compatibility of materials.
   o. Acceptability of substrates.
   p. Temporary facilities.
   q. Space and access limitations.
   r. Governing regulations.
   s. Safety.
   t. Inspecting and testing requirements.
   u. Required performance results.
   v. Recording requirements.
   w. Protection.

2. Record significant discussions and agreements and disagreements of each conference, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site at regular intervals (twice monthly). Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Status of submittals.
   e. Deliveries.
   f. Off-site fabrication problems.
   g. Access.
   h. Site utilization.
   i. Temporary facilities and services.
   j. Hours of work.
   k. Hazards and risks.
   l. Housekeeping.
   m. Quality and work standards.
   n. Change Orders.
   o. Documentation of information for payment requests.

3. The Agenda shall read as follows:
   Project Name
   OWNER/ARCHITECT/CONTRACTOR MEETING AGENDA
   Project No.
   Date/Time

   1. Review minutes of previous meeting
      - Signatures

   2. Submittals/Shop Drawings
      - Status

- Outstanding Items
- Impending submittals

3. Requests for Information
   - Status
   - Outstanding Items
   - Actual or potential problems affecting construction or job progress

4. Architect's Supplemental Instructions
   - Status
   - Outstanding Items

5. Change Orders/Change Order Proposals
   - Status
   - Outstanding Items

6. Schedule
   - Provide updated schedule denoting progress/updates
   - Off-site fabrication and delivery schedules; subcontractor schedules
   - Anticipated delays – impact on schedule, corrective actions taken or proposed
   - Agreement on rain days

7. Sub-contractors and material suppliers
   - Coordination of work

8. Payment Application

9. Other Outstanding Items
   - Contractor to provide foreman's daily reports at jobsite meetings
   - Preinstallation conferences to schedule

10. Questions to the General Contractor/Architect
    -

D. Reporting: No later than 3 days after each meeting the Contractor shall distribute minutes of the meeting to each party present and to parties who should have been present. The minutes shall be agreed to and approved at the subsequent Progress Meeting by Owner's representative, Architect and Contractor by signing and dating. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.6 COORDINATION MEETINGS

A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01 31 19

SECTION 01 32 00
CONSTRUCTION SCHEDULES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and other general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. General description
2. Form and content of schedules
3. Updating of schedules

1.03 GENERAL DESCRIPTION

A. The Construction Schedule is a required submittal, which is subject to the approval of the Architect and which shall be revised periodically as specified herein. The Construction Schedule shall be in a bar-chart or network type form that shall provide complete sequence of construction by activity, and allow for up-dating and revisions. Schedule shall be based on critical path method (CPM), and shall be prepared with input and cooperation of all Contractor's subcontractors.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 FORM AND CONTENT OF SCHEDULES

A. Submit Construction Schedule as described above within 10 days after Notice to Proceed.

B. Provide Construction Schedule with the following format and content:
1. Provide schedule in the form of a bar chart with individual horizontal lines representing the duration of each major activity. Use vertical lines to scale the schedule at one-week intervals.
2. Use the same items of work as shown on schedule of values or in accordance with Section numbers of Specifications.
3. Where related activates must be performed in sequence, show relationship graphically.
4. Incorporate the submittal schedule specified elsewhere.
5. In developing the schedule, take into account administrative reviews.
6. Show dates for the following:
a. Each major activity that influences the construction time (critical path items).
b. Specified pre-installation meetings and progress review meetings.
c. Procurements and delivery dates for products requiring long lead-time.
d. Start and completion dates of all major work elements.
e. Time frame for Substantial and Final Completion procedures, including inspections, reviews and punch list activities.
7. Use the same terminology as that used in Contract Documents and provide legend of symbols or abbreviations used.
8. Submit Construction Schedule in clear, legible, reproducible format and with a minimum of three (3) opaque copies.

C. Architect will advise Contractor if originally submitted Construction Schedule is not satisfactory. If so, Contractor shall revise and resubmit within five (5) days.

D. Prepare and distribute copies of approved Schedule to Architect, Owner, Contractor's subcontractors and other entities whose work will be influenced by schedule dates. Maintain a copy of approved Construction Schedule at Project site office.

3.02 UPDATING OF CONSTRUCTION SCHEDULES

A. Update the Construction Schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which progress meetings are conducted.

B. In revising the Schedule show all changes **by saving the original schedule as a base line**. Indicate the actual progress or delay of each activity and show revised completion dates. Highlight the activities modified since previous submittal and indicate major changes in scope or revised projections due to changes in the Work (if applicable).

3.03 SCHEDULE AND CONTRACTOR'S REQUESTS FOR CHANGES TO CONTRACT SUM OR TIME

A. The Contractor shall indicate in his Change Proposals for all Contract modifications, if the durations of activities are affected, or if activities are added or activities deleted. The effect shall be indicated for each activity in cost and time as applicable. The Change Proposal shall indicate all additional costs and time impacts of whatever nature; reservations for future determination of impacts will not be allowed or considered. The Contractor shall submit a diagram of that portion of the Construction Schedule affected by the change showing the activities and their costs, man loading, durations and Contractor's subcontractor or trade responsibility. While changes of a minor nature may require little or no documentation of schedule impact, the Contractor shall be aware that in cases where time is involved, failure to submit such a diagram with the Change Proposal shall constitute a waiver of any claims for time extensions associated with the subject of that Change Proposal. When modifications in the Work are necessitated by Field Directives or other Architect's authorizations prior to Change Proposal submissions to avoid delay, the Contractor shall furnish the Architect within ten (10) days of receipt of the authorizations which changed the Work the same information required for Change proposals. Failure to do so shall constitute a waiver of any claims for time extensions associated with the subject of the work authorization or directive.

B. As applicable, the Contractor shall adjust the Schedule monthly to reflect any adjustments in time related to negotiated or approved Contract modifications. The updated Schedule shall provide revised completion dates by incorporation of approved change order work and excusable delays, and re computation of all dates, durations and float in accordance with the newly incorporated dates. Such revised completion dates shall be the sole basis for time extensions and adjustments to the Contract completion date. Modified activity times to be used to determine the revised Project completion dates shall be agreed to by the Contractor, Architect and Owner.

END OF SECTION 01 32 00

SECTION 01 32 20
CONTRACT REPORTING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General: This Section specifies administrative and procedural requirements for reports required for proper performance of the Work.

B. Reports required include:
1. Daily construction reports.
2. Field correction reports.
3. Special reports.

1.03 REPORTS

A. Daily Construction Reports: Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel by trade at the site.
4. High and low temperatures, precipitation, and general weather conditions.
5. Accidents (refer to Special Reports).
6. Meetings and significant decisions.
7. Unusual events (refer to Special Reports).
8. Stoppages, delays, shortages, losses.
9. Emergency procedures.
10. Orders and requests of governing authorities.
11. Field Directives, or Change Proposal Requests received; Change Proposals implemented.
12. Services connected, disconnected.
13. Equipment or system tests and start-ups.

B. Field Correction Report: When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report including a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Architect immediately.

C. Special Reports: When an event of an unusual and significant nature occurs at the Project site, prepare and submit a special report. List the chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 32 20

SECTION 01 33 00
SUBMITTALS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Definitions
2. General requirements
3. Submittal schedule
4. Submittal coordination
5. Submittal format and preparation
    a. Shop Drawings
    b. Samples
    c. Product Data
6. Contractor review and responsibilities
7. Architect's review
8. Return, resubmission and distribution

B. Refer to individual Specification Sections for identified equipment and material for which submittals are required.

C. Submittal will be required for each specification section separately.

D. Do not submit on equipment or materials not requested in the Specifications.

1.03 DEFINITIONS

A. Submittals: General term including samples, shop Drawings and product data, as applicable.

B. Samples: Physical examples prepared to illustrate materials, equipment or workmanship to be installed in the Project and to establish standards by which work will be judged as complying with Contract requirements.

C. Shop Drawings: Drawings, diagrams, illustrations, schedules and performance charts, prepared by the entity that is to do the work to illustrate that portion of the Work in detail.

D. Product Data: Dated, printed literature of a product manufacturer which describes product and installation procedures. Product data may include test and performance data, illustrations, standard brochures and special details.

E. Informational Submittals: Submittals indicated in the Contract Documents as to be submitted for information only.

1.04 GENERAL REQUIREMENTS

A. Submittals shall be in orderly sequence and timed to cause no delay in the Work.

B. Contractor shall commence no portion of the Work requiring submittals until submittal has been reviewed and accepted by Architect.

C. Do not utilize submittal review process as a means of requesting substitutions or changes in the scope of the Work.

D. Job delays occasioned by requirement of re-submission of samples, shop Drawings and product data not in accordance with Contract Documents are Contractor's responsibility, and will not be considered valid justification for extension of Contract time.

E. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's review of shop Drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in shop Drawings, product data, samples or similar submittals by the Architect's review thereof.

E. The Contractor shall direct specific attention, in writing or on resubmitted shop Drawings, product data, samples or similar submittals to revisions other than those requested by the Architect on previous submittals.

F. Resubmitted shop Drawings, product data, samples or similar submittals shall be complete and shall cloud or highlight the changes.

1.05 SUBMITTAL SCHEDULE

A. Submit to the Architect a list of all required submittals organized and referenced by the sections of these Specifications. On the list, indicate the timing for submission of the required submittals and relationship to the construction sequence. Submit the schedule to the Architect within the date required for establishment and submission of Contractor's Construction Schedule.

B. Following approval by the Architect of the submittal schedule, print and distribute copies to the Architect, Owner, Contractor’s subcontractors, suppliers and others required to comply with the submittal dates indicated. Maintain a copy in the field. When revisions are made, distribute to same parties that received initial document.

C. Maintain updated submittal schedule during course of the Work that shows status of all submittals. Provide copies for Architect at progress meetings and when requested.

1.06 SUBMITTAL COORDINATION

A. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal well in advance of performance of related construction activities to avoid delay.

B. Coordinate each submittal with other submittals and related activities—purchasing, fabrication, testing, delivery, etc.—that require sequential activity. Coordinate transmittal of different types of submittals for related elements of the Work so submittals can be

reviewed concurrently. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

C. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals. If submittal must be reviewed within a certain time in order to maintain the progress of the Work, state so clearly on the submittal. Nevertheless, allow a minimum of two (2) weeks for the first processing of each submittal and allow even more time if the submittal must be coordinated with later submittals. Allow a minimum of one (1) week for processing of resubmittals. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 SUBMITTAL FORMAT AND PREPARATION

A. Transmittals:

1. Submittals will be accepted only through transmittal from the Contractor. Submittals received from other entities will be returned without review or action.
2. Submittals must be accompanied by a transmittal form containing the following information:
   a. Project name.
   b. Submittal date.
   c. Transmittal number.
   d. Applicable Specifications Section number.
   e. To: Architect's name and address.
   f. From: Contractor's name and address.
   g. Name of applicable subcontractor(s), supplier(s) or manufacturer(s).
   h. Submittal type (shop drawing, sample, product data, informational submittal).
   i. Description of submittal.
   j. Record of distribution.
   k. Action marking.
   l. List of any deviations from Contract Document requirements.
   m. Comments.

B. Form, Size and Quantity:

1. All product data and shop drawing submittals shall be submitted digitally in PDF format to the Architect. All PDF page sizes shall be standard sizes suitable for print, i.e. 8-1/2x11, 11x17, 24x36 or 30x42. If PDF file exceeds 10 megs the Architect will provide the Contractor with directions to access the Architect’s ftp site for submission of file.

2. Label each submittal with the following information:
   a. Project name.
   b. Date of submittal.
   c. Contractor's name and address.
   d. Architect's name and address.

e. Subcontractor's name and address.
f. Supplier's name and address.
g. Manufacturer's name.
h. Specification section where the submittal is specified.
i. Numbers of applicable drawings and details.
j. Other necessary identifying information.

3. Provide a space on each submittal for approval stamp and notations.
4. For Physical Samples Submittals provide three (3) physical sets with transmittal including all information indicated above to the Architect.
5. Contractor shall stamp and sign in red ink on all copies.

C. Shop Drawing Preparation and Format:

1. Shop Drawings shall conform to the following content requirements:
   a. Number Drawings consecutively
   b. Indicate working and erection dimensions and relationship to adjacent work at accurate scale.
   c. Show arrangements and sectional views, where applicable.
   d. Show compliance with specific referenced standards, such as materials, gauges, thickness, finishes, and characteristics.
   e. Name specific products or materials used.
   f. Indicate anchoring and fastening details, including information for making connections to adjacent work.
   g. Contractor shall make any and all modifications in red ink and shall sign in red ink.
2. Reference applicable details, sections and similar information from Drawings from which shop drawing data was developed; include applicable Specification Section numbers and names.
3. Do not reproduce Contract Documents or copy standard information as basis of shop Drawings. Standard information prepared without specific reference to the Project is not considered shop Drawings.

D. Sample Preparation:

1. Required samples shall be submitted for the Architect's selection and review so as to maintain construction progress. Acceptance and color selections will not be made unilaterally where selections regarding adjacent materials must be made for purpose of aesthetics. Submit samples for adjacent and inter-related materials concurrently.
2. Prepare samples in sizes, shapes and finishes in accordance with provisions of individual Specification sections; attach documentation showing compliance. Where samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product. Submittals will be reviewed and returned with Architect's selection indicated and other action as appropriate.
3. Samples furnished under this section are not to be confused with full-size, on-the-site "mock-ups," which may be specified in certain sections of the Specifications.
4. Keep final approved samples or sample sets at Project site for use during progress of the Work.

E. Product Data Preparation and Format:

1. When Product Data submittals are prepared specifically for the Project (in the absence of standard printed information) submit such information as Shop Drawings.
2. Content:
   a. Submit manufacturer's standard printed data sheets.
   b. Identify the particular product being submitted; submit only pertinent pages.
   c. Show compliance with properties specified.
   d. Identify which options and accessories are applicable.
   e. Include recommendations for application and use.
   f. Show compliance with the specific standards referenced.
   g. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
   h. Identify dimensions which have been verified by field measurement.
   i. Show special coordination requirements for the product.

3.02 CONTRACTOR'S REVIEW AND RESPONSIBILITIES

A. Review submittals and stamp with approval prior to submission to the Architect. Contractor's stamp shall bear the Contractor's name and word "Approved," date of the approval, and shall be initialed by the individual responsible for reviewing submittals. Enter stamp on a blank, unmarked area on the submittal.

B. By approving submittals, Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

C. **Any Submittals reviewed and sent to the Architect by the Contractor which is deemed to be incomplete or in non-conformance with the contract documents will be sent back to the Contractor as REJECTED. Any submittals requiring more than two reviews by the Architect due to incompleteness or failure of the Contractor to review and coordinate the submittal package and scope of work will incur additional costs to the Contractor in the amount of $500.00 per additional submittal review. Additional submittal review costs will be deducted from the contract amount via change order.**

D. Where work is indicated "By others," Contractor shall indicate responsibility for providing and coordinating such work; whether by subcontractor or under separate contracts.

E. Contractor agrees that submittals processed by Architect are not substitutions or changes in scope of the Work; that purpose of submittals by Contractor is to demonstrate that Contractor understands design concept; that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing fabrication and installation methods he intends to use.

F. Contractor represents by submitting samples, shop drawing and product data that he has complied with provisions specified above. Submissions made without Contractor's approval indicated thereon will be returned without being reviewed for compliance with these requirements.

G. Accompany submittal with transmittal letter containing Project name, Contractor's name, number of samples or drawings, titles and other pertinent data. Transmittal shall outline deviations, if any, in submittals from requirements of Contract Documents.

H. No portion of the Work requiring submission of a shop drawing, product data or sample shall be commenced until the submittal has been reviewed and accepted by the Architect as specified herein. All such portions of the Work shall be executed in accordance with accepted submittals bearing the Architect's stamp.

3.03 ARCHITECT'S REVIEW AND ACCEPTANCE

A. Architect's review and acceptance is only for conformance with design concept of Project and with information in Contract Documents. Architect's acceptance of a specific item shall not indicate acceptance of an assembly in which item is a component. The Architect's review is not conducted for the purpose of determining the accuracy and completeness of details such as dimensions and quantities, or for substantiating instructions for installation of equipment or systems, which remain the responsibility of the Contractor. When professional certification of performance characteristics of materials, systems, or equipment is required by the Construction Documents, the Architect shall be entitled to rely upon such certifications to establish the materials, systems or equipment will meet performance criteria required by the Construction Documents.

B. Architect will review each submittal, mark it with appropriate action, and return it to Contractor with reasonable promptness, except where it must be held for coordination, and the Contractor is so advised. Submittals will be marked by Architect as follows:

1. "Reviewed" indicates the Drawings have been reviewed for conformance with design and no exceptions are taken. Proceed with the work.
2. "Make Corrections as Noted" indicates Contractor may proceed with the work as noted.
3. "Amend and Resubmit" indicates Drawings to be revised and resubmitted for review prior to proceeding with the work.
4. "Rejected, See Remarks" indicates that the submittal does not comply with Contract Documents.
5. The Architect shall make any and all comments in green ink and shall sign in green ink.

C. Submittals required to be submitted "for Architect's information only" are required to demonstrate that the Work complies with performance requirements of the Contract Documents. Such submittals, if acceptable to Architect, will not be returned to Contractor.

3.04 SUBMITTAL RETURN, RESUBMISSION AND DISTRIBUTION

A. Architect will return the following reviewed and accepted submittals for printing and distribution by Contractor:

1. Shop Drawings: PDF format by email. If PDF file exceeds 10 megs the Architect will provide the Contractor with directions to access the Architect's ftp site for access to the file.
2. Product Data: PDF format by email. If PDF file exceeds 10 megs the Architect will provide the Contractor with directions to access the Architect's ftp site for access to the file.
3. Samples: Two (2) physical sets, unless additional sets were submitted because of needs of Contractor's subcontractors or suppliers. Samples shall be provided during a regularly scheduled meeting, or mailed to the Architect's office.

B. Resubmissions: In making resubmissions, follow the same procedures and formats required for original submissions. Make corrections and changes indicated by Architect

on unacceptable submissions. In resubmission transmittals, identify clearly and direct specific attention to any revisions other than corrections requested by Architect on previous submissions.

C. Distribution:

1. Contractor is responsible for obtaining and distributing copies of submittals to his subcontractors and material suppliers after final acceptance. Prints of reviewed shop Drawings shall be made from reproducibles that carry the Architect's appropriate stamp.
2. Contractor shall maintain a file of accepted submittals bearing the Architect's stamp for duration of Project, which shall be delivered to Owner as a part of the Project's Record Documents.
3. The Contractor's superintendent also shall maintain an orderly file of all accepted submittals at the Project site. In the event that the Architect or Owner should question the installation of any aspect of the Work requiring accepted submittal data, the inability of the superintendent to produce the required accepted submittal data upon demand shall constitute cause for a "stop work" order to be issued on that particular questioned aspect of the Work and all relevant appurtenant work. The cause shall be equal to the Contractor's not having received required acceptance of the submittal data. If so issued, such "stop orders" shall not be considered valid justification for extensions of Contract time or claims for additional monetary compensation.

END OF SECTION 01 33 00

SECTION 01 45 33
SPECIAL INSPECTIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Division 1 Quality Control.

C. Attached Statement of Special Inspections and Schedule of Special Inspections Services.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for International Building Code Chapter 17 Special Inspection Requirements.

B. Special Inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

C. Special Inspections Services shall be in accordance with Chapter 17 Structural Tests and Special Inspections of the 2018 International Building Code.

1.03 RESPONSIBILITIES

A. Contractor: Contractor shall not be responsible for engaging, selecting or procuring the Special Inspections Services Agency. Contractor shall be required to coordinate the following items with the Special Inspections Agency:

1. Maintain a certified written report of each test, inspection, and similar quality-control service provided by Special Inspections Agent.
2. Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
3. Should any portion of the work tested fail and require retesting the Contractor shall be responsible for all costs associated with retesting. Contractor shall also be responsible for all costs borne by the testing agency if the Contractor fails to notify the testing agency of work not ready for the scheduled testing.

B. Special Inspections Agency: Conducted by a qualified Special Inspections Agent as required by Chapter 17 of the 2018 International Building Code as indicated in attached Statement of Special Inspections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor.
4. Submitting a final report of special inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Contractor’s reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: GILLEM PUBLIC SAFETY FACILITY

LOCATION : LAND LOTS 211 AND 212, DISTRICT 12

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

ARCHITECT OF RECORD: KENT SNYDER, AIA

STRUCTURAL ENGINEER OF RECORD: WILLIAM J PELTIER, PE, SE

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: WILLIAM J PELTIER, PE, SE

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2018 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Special Inspections for Seismic Resistance* and/or *Special Inspections for Wind Resistance*.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly __Bi-Weekly X Monthly Other; specify:_____

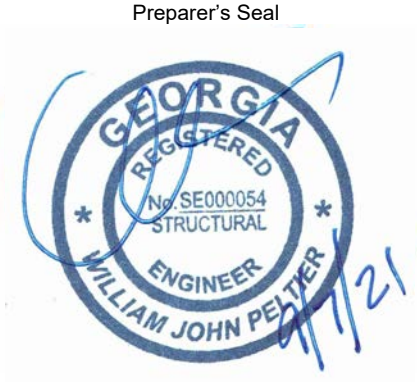
The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

WILLIAM J PELTIER
Type or print name

Signature — 03 September 2020 Date

Preparer's Seal



Building Official's Acceptance:

Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

Special Inspections
for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: C

Special Inspections for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Where required per IBC Sections 1705.12.1, 1705.12.2, and 1705.12.3) (Special inspections for seismic resistance of structural steel, where required, shall be in accordance with AISC 341)

PRE-CAST SHEARWALLS – BY SPECIALTY ENGINEER

Description of designated seismic systems subject to special inspection and testing for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F.)

1. Sprinkler attachments.

Description of additional seismic systems and components requiring special inspections:
(Required for systems noted in IBC Section 1705.12.5, 1705.12.6, 1705.12.7, and 1705.12.8)

1. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports.

Description of additional seismic systems and components requiring testing:
(Where required per IBC Section 1705.13)

N/A

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTIONS SERVICES

PROJECT					
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.1.1 Special Cases (work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements - add additional rows as needed.)	Submittal review, shop (3) and/or field inspection				
1705.2.1 Structural Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 360, Section N 3.2 for compliance with construction documents)	Submittal Review	Y	Each submittal	3	
2. Material verification of structural steel	Shop (3) and field inspection	Y	Periodic	1	
3. Structural steel welding:					
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	1	
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection	Y	Observe (4)	1	
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	1	
d. Nondestructive testing (NDT) of welded joints: *see Commentary*					
1) Complete penetration groove welds 5/16" or greater in *risk category* III or IV	Shop (3) or field ultrasonic testing - 100%	Y	Periodic	1	
2) Complete penetration groove welds 5/16" or greater in *risk category* II	Shop (3) or field ultrasonic testing - 10% of welds minimum	Y	Periodic	1	
3) Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing	Y	Periodic	1	
4) Fabricator's NDT reports when fabricator performs NDT	Verify reports	Y	Each submittal (5)	1	
4. Structural steel bolting:	Shop (3) and field inspection				
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360, Table N5.6-1)		Y	Observe or Perform as noted (4)	1	
b. Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360, Table N5.6-2)		Y	Observe (4)	1	
1) Pre-tensioned and slip-critical joints					
a) Turn-of-nut with matching markings		Y	Periodic	1	
b) Direct tension indicator		Y	Periodic	1	
c) Twist-off type tension control bolt		Y	Periodic	1	
d) Turn-of-nut without matching markings		Y	Continuous	1	
e) Calibrated wrench		Y	Continuous	1	
2) Snug-tight joints			Periodic	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT					
MATERIAL / ACTIVITY	**SERVICE**	**APPLICABLE TO THIS PROJECT**			
		Y/N	**EXTENT**	**AGENT***	**DATE COMPLETED**
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)		Y	Perform (4)	1	
5. Visual inspection of exposed cut surfaces of galvanized structural steel main members and exposed corners of the rectangular HSS for cracks subsequent to galvanizing	Shop (3) or field inspection	Y	Periodic	1	
6. Embedments (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Y	Periodic	1	
7. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Y	Periodic	1	
1705.2.2 Cold-Formed Steel Deck					
1. Manufacturer documents (Verify reports and certificates as listed in SDI QA/QC, Section 2, Paragraphs 2.1 and 2.2 for compliance with construction documents)	Submittal Review	Y	Each submittal	1	
2. Material verification of steel deck, mechanical fasteners and welding materials	Shop (3) and field inspection	Y	Periodic	1	
3. Cold-formed steel deck placement:	Shop (3) and field inspection				
a. Inspection tasks Prior to Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.1)		Y	Perform (4)	1	
b. Inspection tasks After Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.2)		Y	Perform (4)	1	
4. Cold-formed steel deck welding:	Shop (3) and field inspection				
a. Inspection tasks Prior to Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.3)		Y	Observe (4)	1	
b. Inspection tasks During Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.4)		Y	Observe (4)	1	
c. Inspection tasks After Welding (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.5)		Y	Perform (4)	1	
5. Cold-formed steel deck mechanical fastening:	Shop (3) and field inspection				
a. Inspection tasks Prior to Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.6)		Y	Observe (4)	1	
b. Inspection tasks During Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.7)		Y	Observe (4)	1	
c. Inspection tasks After Mechanical Fastening (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.8)		Y	Perform (4)	1	
1. Material verification of cold-formed steel deck:					
a. Identification markings	Field inspection	Y	Periodic	1	
b. Manufacturer's certified test reports	Submittal Review	Y	Each submittal	1	
2. Connection of cold-formed steel deck to supporting structure:	Shop (3) and field inspection				

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT					
MATERIAL / ACTIVITY	**SERVICE**	**APPLICABLE TO THIS PROJECT**			
		Y/N	**EXTENT**	**AGENT***	**DATE COMPLETED**
a. Welding		Y	Periodic	1	
b. Other fasteners (in accordance with AISC 360,Section N6)					
1) Verify fasteners are in conformance with approved submittal		Y	Periodic	1	
2) Verify fastener installation is in conformance with approved submittal and manufacturer's recommendations		Y	Periodic	1	
3. Reinforcing steel	Shop (3) and field inspection				
a. Verification of weldability of steel other than ASTM A706		Y	Periodic	1	
b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, boundary elements of special concrete structural walls and shear reinforcement		Y	Continuous	1	
c. Shear reinforcement		Y	Continuous	1	
d. Other reinforcing steel		Y	Periodic	1	
1705.3 Concrete Construction					
1. Inspection and placement verification of reinforcing steel and prestressing tendons.	Shop (3) and field inspection	Y	Periodic	1	
2. Reinforcing bar welding:		NA			NOT PERMITTED
a. Verification of weldability of bars other than ASTM A706.			Periodic		
b. Inspection of single-pass fillet welds 5/16 or less in size.			Periodic		
c. Inspection of all other welds.			Continuous		
3. Inspection of anchors cast in concrete.	Shop (3) and field inspection	Y	Periodic	1	
4. Inspection of anchors post-installed in hardened concrete members per research reports, or, if no specific requirements are provided, requirements shall be provided by the registered design professional and approved by the building official, including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque	Field inspection		Periodic or as required by the research report issued by an approved source		
a. Adhesive anchors installed in horizontal or upward-inclined orientation that resist sustained tension loads.		Y	Continuous	1	
b. Mechanical and adhesive anchors note defined in 4a.		Y	Periodic	1	
5. Verify use of approved design mix	Shop (3) and field inspection	Y	Periodic	1	
6. Prior to placement, fresh concrete sampling, perform slump and air content tests and determine temperature of concrete and perform any other tests as specified in construction documents.	Shop (3) and field inspection	Y	Continuous	1	
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Y	Continuous	1	
8. Verify maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Y	Periodic	1	
9. Inspection of prestressed concrete:	Shop (3) and field inspection				
a. Application of prestressing force		Y	Continuous	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT					
MATERIAL / ACTIVITY	**SERVICE**	**APPLICABLE TO THIS PROJECT**			
		Y/N	**EXTENT**	**AGENT***	**DATE COMPLETED**
b. Grouting of bonded prestressing tendons		Y	Continuous	1	
10. Inspect erection of precast concrete members		Y	Periodic	1	
11. Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs	Review field testing and laboratory reports	NA	Periodic		
12. Inspection of formwork for shape, lines, location and dimensions	Field inspection	Y	Periodic	1	
13. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic	1	
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	
3. Perform classification and testing of compacted fill materials.	Field inspection	Y	Periodic	1	
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous	1	
5. Prior to placement of controlled fill, inspect subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTIONS SERVICES

PROJECT					
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.10 Fabricated items					
1. List of fabricated items requiring special inspection during fabrication:	Shop inspection		As noted in each applicable shop activity		
Precast insulated load bearing wall panels, and double tee roof framing.		Y		1	
Precast parking deck lateral load resisting elements		Y		1	
2. List of fabricated items to be fabricated on the premises of a fabricator approved to perform such work without special inspection (including name of approved agency providing periodic auditing):					
1705.17 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop	Field testing	Y	Per ASTM E2174	1	
2. Inspect fire-resistant joint systems	Field testing	Y	Per ASTM E2393	1	

* INSPECTION AGENTS FIRM	ADDRESS	TELEPHONE NO.
1. INSPECTIONS & TESTING AGENCY (TA) TO BE DETERMINED AT A LATER DATE		
2. PPI (AOR)	400 Pike Blvd	770-993-2034
	Lawreceville, GA 30046	
3. William J Peltier and Associates, Inc (EOR)	270 Langley Dr	770-963-0654
	Lawreceville, GA 30046	
4.		

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. Shop Inspections of fabricated items are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.1 and listed in activity 1709.2.

4. Observe: Observe on a random basis, operations need not be delayed pending these inspections. Perform: These tasks shall be performed for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N6.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*? **Yes**

Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections*? **No**

DATE: 9/7/2020

SECTION 01 50 00
TEMPORARY FACILITIES, CONTROLS AND SERVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 and 0 Specifications, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Definitions
2. Project conditions and scheduling
3. Temporary construction support facilities
4. Temporary utilities and services
5. Special protection requirements
6. Security – Also refer to Division 0 for detailed requirements
7. Vehicular access and parking
8. Termination and removal

1.03 DEFINITIONS

A. Temporary Construction Support Facilities: Construction, structures, fixtures and other built items required to accomplish the Work but which are not incorporated into the finished Work. Included are field offices, storage sheds, temporary roads and paving, temporary enclosures, hoists, dewatering facilities, temporary signs, construction aids and miscellaneous facilities.

B. Temporary Utilities: Sources of electric power, water, natural gas, etc., obtained from public utilities, other main distribution systems or temporary sources that support the Contractor's activities but are not a part of the permanent construction or are not yet incorporated into the permanent construction.

C. Temporary Services: Activities and services required during construction that do not directly accomplish the Work. Included are waste disposal services, rodent and pest control, security and miscellaneous services.

1.04 PROJECT CONDITIONS AND SCHEDULING

A. Comply with requirements of regulations, governing authorities and public utilities as to type, quantity, location and use of temporary facilities, utilities and services. Secure and maintain copies of permits, inspection reports or approvals for installation and use of temporary facilities and utilities.

B. Use of permanent facilities prior to date of Substantial Completion is subject to Owner's conditions. During said approved use, Contractor shall maintain and protect completed work. Specific warranties shall not be reduced or voided by Contractor's use of permanent facilities and systems.

C. Maintain required temporary facilities until not needed or until Substantial Completion. Exceptions to this requirement may be made by Owner as indicated in above paragraph.

1.05 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
   1. Building code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, fire department, and rescue squad rules.
   5. Environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
   1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

PART 2 – PRODUCTS

2.01 TEMPORARY CONSTRUCTION FACILITIES

A. **Provide a minimum of one (1) construction trailer at the Project site. Construction trailer shall be capable of holding Project meetings in a conditioned space with table, chairs, toilet, sink, and internet connectivity.**

B. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical or aerated recirculation. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

C. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, pilot light for connection of power tools and equipment.

F. Tarpaulins: Provide waterproof fire-resistant UL labeled tarpaulins with flame spread rating of 15 or less.

G. Fire Extinguishers: Provide hand-carried portable UL-rated Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated Class ABC, dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. Use qualified personnel or services for installation of temporary facilities. Provide each facility ready to use when needed to avoid delay. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as needed. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 CONSTRUCTION SUPPORT FACILITIES

A. Temporary Storage Facilities: Provide weather tight storage facilities with raised floors and of types and sizes required by storage demands at the Project site. Locations of temporary storage facilities shall be subject to Owner's acceptance. All material storage and staging shall be within the designated limits of the Project site. Contractor is responsible for identifying Project site boundaries and insuring that staging and material storage does not occur outside of the site.

B. Provide a dedicated area for the storage of tools and equipment within each phased work area. The Contractor will be required to secure all tools at the conclusion of each work day and maintain a log of equipment and tools located on site. Combustibles and hazardous materials shall not be stored inside the building overnight or at any time when construction personnel are not present. The Contractor shall notify the Owner and all such materials shall be approved prior to bringing items into the building.

C. Temporary Enclosures: As required by the progress and sequencing of the Work, provide temporary enclosures for protection of construction in progress or completed, from exposure to foul weather or other construction operations.

1. Maintain protective barriers, vehicular barriers, temporary fencing, dust control barriers and sound control devices as needed for all phases of construction until final completion of the Project. Barriers and devices shall be coordinated with the staging and sequencing of the Work. Contractor shall be responsible for replacing established protective barriers and devices damaged or removed during construction and shall install any additional protection devices as required to perform the Work under this Contract.
2. Provide temporary signs as required. Install signs where needed to inform personnel, vendors and public seeking entrance to the Project.
3. Security, access and working requirements will be discussed at length during the preconstruction meeting and are outlined in Division 0 of these specifications.
4. The Contractor is responsible for all temporary construction, phasing, scheduling, material deliveries, and other items that affect the sequence of construction or scheduling of the Project.

D. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide applicable paper goods in support of each facility. Provide covered waste containers for used materials.
1. Toilets: Provide and maintain temporarily sited and self-contained toilet units until Substantial Completion on all Work. Do not allow employees to use permanent toilet facilities of the new construction.
2. Wash Facilities: Provide and maintain a safety shower/eye wash facility with potable water at a location convenient for personnel.
3. Drinking Water Facilities: Provide drinking water canisters or fixtures at convenient locations on the Project site. Include cup supply.

3.03 TEMPORARY UTILITIES AND SERVICES

A. General: Engage the appropriate local utility companies to install temporary services or connect to existing services. Where company will not be responsible for full operation of service, Contractor shall provide remainder with matching, compatible materials and equipment and comply with company recommendations. Contractor shall provide adequate capacity at each stage of construction. Costs for temporary utility connection are borne by the Contractor. **The utility usage cost for all utilities shall be included in the base bid.**

B. Telecommunications Services: Maintain cell phones for Project Manager and Superintendent.

C. Water Services: Temporary water shall be provided and paid for by the Contractor.

D. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere on Project site **DAILY**. **Dedicated dumpsters for construction debris shall be provided.** Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold waste materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.04 VEHICULAR ACCESS AND PARKING

A. Haul Routes: The Contractor shall be responsible for insuring that trucks providing delivery and/or hauling services to or from the Project site shall properly cover loads. Contractor shall keep the roads to the Project site and the Project site clear, free of mud, dirt, debris, or other materials that are deposited as a result of Contractor's hauling and delivery services. The Contractor is responsible for coordinating and scheduling hauling activities so that the traffic flow on the access road to the Project site is not disrupted at any time.

B. Parking Areas: All parking for Contractor's employees, subcontractors' employees, and for vendors, delivery men, and visitors shall be on the Project site and in designated areas of the phasing Construction Documents.

C. Traffic Control: The Contractor shall provide all traffic control on streets or drives adjacent to or on the Project site that is needed to facilitate the Contractor's Work and protect the public from activities associated with such work. These controls shall include signs, signals, barricades and flagmen, as necessary. The Contractor shall comply with all local, state, federal rules and regulations concerning the placement and use of traffic control devices

3.05 TEMPORARY PROTECTION AND CONTROL

A. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Maintain protective barriers, tree protection and erosion control devices until Final Completion of the Project. Contractor shall be responsible for replacing established protective barriers, tree protection and erosion control devices damaged or removed during construction and shall install any additional protection devices as required to perform the Work under the Contract.

3.06 MAINTENANCE, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until Project completion.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference from the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of Project identification signs.
2. Remove all trash and debris and restore areas to conditions required by the Contract.

END OF SECTION 01 50 00

SECTION 01 55 26
TRAFFIC CONTROL

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. **CONTRACTOR SHALL MAINTAIN ACCESS AND USABILITY OF THE PRIVATE ACCESS DRIVE ALONG THE WEST EDGE OF THE PROPERTY FOR THE DURATION OF CONSTRUCTION. AT NO TIME SHALL THIS DRIVE BE CLOSED OR PARTIALLY BLOCKED. THE PRIVATE ACCESS DRIVE SHALL NOT BE UTILIZED FOR ANY LAYDOWN OF MATERIALS OR STAGING OF ANY EQUIPMENT.**

B. Contractor shall furnish all materials and labor for the installation and continuous maintenance of traffic control devices throughout the project.

C. This item of work shall include furnishing, installing, maintaining, relocating and removing all traffic control devices used for the purpose of regulating, warning or directing traffic during the construction or maintenance of this project.

D. Upon completion of work, warning devices are to be removed by the contractor. If devices remain on site longer than ten (10) days after project completion, they shall be removed by the Owner and become their property.

1.02 SAFETY

A. The governing factor in the execution and staging of work for this project is to provide the public with the safest possible travel conditions along the roadway through the construction zone. The Contractor shall arrange his operation to keep the closing of any lane of a roadway to an absolute minimum.

B. No work shall be started on any phase of the project until all appropriate traffic control devices are in place and in operation.

C. Contractor is to take all practical precautions to maintain traffic flow, and provide safety of workers and the general public.

D. At the end of each workday, contractor is to clear the roadway of all dirt and debris and add additional safety devices to maintain safe travel lanes.

E. When not in use, all traffic control devices shall be removed, placed or covered so as not to be visible to traffic.

1.03 REFERENCES

A. Manual for Uniform Traffic Control Devices (MUTCD) (latest edition).

B. Georgia Department of Transportation (Ga. DOT) Standard Specifications for Construction of Roads and Bridges (latest edition), Section 150.

C. Georgia Department of Transportation (Ga. DOT) Standard Construction Details (latest edition).

PART 2 – PRODUCTS

2.01 GENERAL

A. Traffic Control Devices Include: Signs and their supports, signals, pavement markings, barricades with sand bags, channelizing devices, warning lights, arrowboards, flaggers, or any other device used for the purpose of regulating, warning or guiding traffic through the construction zone.

B. All Traffic Control Devices used on this project shall conform to the plans, Ga. DOT Construction Details and Specifications, and MUTCD. No modifications will be allowed without prior written approval of the Engineer.

C. Traffic Control Devices shall be in proper, acceptable condition when in use. Devices which are unclear, damaged, or not correctly positioned shall be promptly restored to fully operational condition.

PART 3 – EXECUTION

3.01 GENERAL

A. The contractor shall be responsible for the proper location, installation, and arrangement of all traffic control devices. Special attention shall be given to advance warning signs during construction operations in order to keep lane assignment consistent with barricade placement at all times. The contractor shall cover all Traffic Control Devices that are inconsistent with detour or lane assignment patterns during the transition from one construction stage to another.

B. Construction signs referring to daytime lane closures during working hours shall be removed or covered during non-working hours.

C. When applicable the contractor shall coordinate all traffic control work on this project with adjoining or overlapping projects, including barricade placement necessary to provide a uniform traffic detour pattern. When directed by the Engineer, the contractor shall remove all Traffic Control Devices that were furnished, installed and maintained by him under this contract, and such devices shall remain the property of the contractor.

D. The contractor shall ensure all Traffic Control Devices installed by him are operational 24 hours a day, including weekends and holidays. Provide additional inspections at regular intervals.

E. When traveling in lanes open to public traffic, the contractor's vehicles shall always move with and not against or across the flow of traffic. These vehicles shall enter or leave work areas in a manner that will not be hazardous to, or interfere with, traffic and shall not park or stop except within designated work areas. Personal vehicles shall not park within the right of way except in specific areas designated by the engineer.

F. Private driveways and parking areas shall be accessible at all times unless temporary closings are necessary for construction work and the Contractor has notified the affected individuals and has approval from them.

G. If trenches are to remain open overnight, or for an extended period of time, contractor is to provide heavy-duty cover plates to allow vehicles access.

H. Delays to the contractor caused by complying with these requirements will be considered incidental to the item for traffic control and protection, and no additional compensation will be allowed.

I. Where flaggers are required, they are to be adequately trained and qualified for the job.

END OF SECTION 01 55 26

SECTION 01 65 00
MATERIAL AND EQUIPMENT HANDLING AND STORAGE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. Section Includes:
1. Procedures for transportation and handling.
2. Procedures for delivery and receiving.
3. Procedures for storage.

1.03 DESCRIPTION

A. Requirements of this Section are general in nature. Refer to individual sections of the Specifications for additional, specific requirements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 PROCEDURES FOR TRANSPORTATION AND HANDLING

A. Require suppliers to deliver manufactured Products to Project site in manufacturers' original packaging with labels and seals intact. Labels shall indicate manufacturer, product name, application instructions and fire resistive classifications.

B. Require suppliers to package products and materials in a manner that will protect them from damage during shipping, handling and storage. Arrange to transport products and materials by methods that avoid damage.

3.02 PROCEDURES FOR DELIVERY AND RECEIVING

A. Provide labor and equipment adequate to handle delivery of products and materials by methods that prevent damage. Provide additional protection as necessary during handling to prevent damage to products and packaging. Lift large and heavy components at designated lift points only.

B. Schedule deliveries to minimize long-term storage at the Project site and prevent over-crowding of construction spaces. Coordinate deliveries with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft and other losses.

C. Promptly inspect all materials and products upon delivery to ensure proper material, color, type and quantity, and to ensure that materials are undamaged and properly protected. Verify compliance with requirements of Contract Documents and approved submittals.

D. Clearly mark partial deliveries to identify contents, permit easy accumulation of entire delivery and facilitate assembly.

3.03 PROCEDURES FOR STORAGE

A. Store materials and equipment in a safe and protected manner. Observe manufacturer's recommendations for positioning, separation and ventilation, as applicable.

B. Store materials at the Project site in a manner that will facilitate inspection, measurement, or counting of units. Store unpacked or loose products on shelves, in bins, or in neat groupings of like items.

C. Where materials are required to be stored in protected conditioned environments, maintain temperatures and humidity within ranges required by manufacturer's instructions unless otherwise specified.

D. Store heavy materials in manner that will not endanger supporting construction.

E. Prevent corrosion, soiling, damage, deterioration, or breakage of materials or contact with deleterious materials.

F. Deliver finish materials only to enclosed and conditioned spaces and where adequate indoor storage facilities are available.

G. Store and handle paints and similar products subject to spillage in areas where spills will not deface finished surfaces or other work.

H. Flammable or Hazardous Materials:
1. Store minimum quantities in protected areas.
2. Provide appropriate type fire extinguisher near said storage areas.
3. Observe manufacturer's precautions and applicable ordinances and regulations.
4. Flammable and Hazardous Materials shall not be stored inside the building.

I. Comply with manufacturer's product data in all aspects of basic material storage, usage, handling, and installation, except where more stringent requirements are specified.

J. Provide Material Safety and Data (MSDS) Sheets for all items, materials and products as required by laws, rules, regulations, ordinances or codes.

END OF SECTION 01 66 00

SECTION 01 71 23
FIELD ENGINEERING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:
   1. Land survey work.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Contract Closeout" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.

B. Final Property Survey: Submit two (2) bond copies and an electronic CAD file of the final property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

A. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located, to perform required land-surveying services.

B. Engineer Qualifications: Engage an engineer of the discipline required, licensed in the state where the Project is located, to perform required engineering services.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Identification: The Owner will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

   1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
   2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of two (2) permanent benchmarks on the site, referenced to data established by survey control points.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.
   1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
   1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
   2. As construction proceeds, check every major element for line, level, and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.
   1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

E. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

F. Final Property Survey: Prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01 71 23

SECTION 01 71 25
CONSTRUCTION STAKING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Construction staking shall include all the surveying work required to layout the site work and control the location of the finished construction.

1.02 QUALITY ASSURANCE

A. Construction staking will be performed under the supervision of a licensed surveyor registered in the State of Georgia who is acceptable to the Owner.

1.03 SUBMITTALS

A. Submit name, address, telephone number and registration number of surveyor prior to beginning work.

B. Upon request, submit documentation verifying accuracy of survey work. Documentation may include, but is not limited to original field notes, worksheets, etc.

C. Submit at least two sets of prints of "as-built" drawings with a surveyor's certificate verifying that elevations and locations are in conformance with the contract drawings. Base drawings will be provided by the Engineer.

1.04 JOB CONDITIONS

A. The Owner will furnish sufficient monuments and benchmarks at the site as shown on site drawing to allow a system of construction staking to be done with reasonable effort.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. The Contractor shall furnish and use surveying equipment and supplies maintained in good working order.

PART 3 – EXECUTION

3.01 GENERAL

A. The property boundary is the primary reference for the work.

B. Field notes must be kept and may be inspected by the Owner or Owner's Representative at any time.

C. Contractor shall be responsible for line and grade stakes, and for resetting same if destroyed.

D. Outer limits of all cuts and fills shall be set by slope stakes. This work shall be examined by Owner and, on his approval, grading will begin.

3.02 FINAL GRADES

A. "Blue Tops" shall be installed to control final paving subgrade. Any variance with plan grades shall be identified by the surveyor and approved by the Owner's Representative prior to paving base installation.

3.03 UTILITIES

A. Staking of utilities shall be done in accordance with the generally accepted practice for the type or utility involved.

B. Storm drain lines and drainage structure bases shall be correctly located to yield the drainage structure top locations and orientations shown on the plan drawings.

3.04 AS-BUILT PLANS

A. As-built plans of all construction shall be maintained by the Contractor. These plans shall be certified by a licensed surveyor and turned over to the Owner's Representative at end of project.

END OF SECTION 01 71 25

SECTION 01 73 00
CONSTRUCTION EXECUTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. General examination requirements.
2. General installation procedures and requirements
3. Installation requirements for building components.
4. Hot work permit and Safety Requirements
5. Safety precautions and requirements
6. Phasing Requirements

1.03 DEFINITIONS

A. Concealed Spaces: Spaces not accessible after completion of construction.

B. Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse; resulting in soiling, marring, breakage, corrosion, rotting or impairment of function.

C. Debris: Rubbish, waste materials, litter, volatile wastes, and similar materials.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 GENERAL EXAMINATION REQUIREMENTS

A. Prior to performing work, examine the applicable substrates and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.

B. Contractor shall be responsible for verifying and obtaining proper substrate conditions, tolerances and material alignments to receive applied or attached materials and construction.

C. Conditions that could have been discovered by examination of Project site and Drawings will not be allowed as cause for claims for extra work. In particular these conditions include:
1. Underground utilities.
2. Existing facilities, structures and appurtenances, on the site of the Project with which the Contractor must coordinate during construction and that can be reasonably discerned.
3. Space requirements of items shown diagrammatically on Drawings.
4. Limitations on transport and storage of materials and equipment.
5. Locations of points of connections to utilities.

3.02 GENERAL PREPARATION REQUIREMENTS

A. Take field measurements as required to fit work properly and recheck measurements prior to installing each product. Notify Architect promptly of any discrepancy in

dimensions between Drawings and field measurements that will affect a current or anticipated installation.

3.03 WORKING TIMES

A. **The basic hours of work for the Contractor shall be 7:00 a.m. through 5:00 p.m., Monday through Saturday.** No work will be allowed outside of these hours unless scheduled in advance. The Contractor shall notify the Owner in advance for scheduling off-hours work.

3.03 GENERAL INSTALLATION PROCEDURES

A. All construction shall be in accordance with all applicable federal, state, and local codes and regulations.

B. Accurately locate the work and components of the work; make vertical work plumb; make horizontal work level. Align materials to give smooth uniform surface planes within specified tolerances.

C. The Contractor is responsible for all temporary construction, phasing, scheduling, material deliveries, and other items that affect the sequence of construction or scheduling of the Project and shall coordinate with the Owner’s facility operations.

D. Shut down of some utilities will be required in order to construct this Project. These shut down activities may need to be performed after business hours and are to be coordinated with the Owner in advance.

E. All mechanical, electrical and plumbing sub-contractors shall submit affidavits for each building permit to the building permits section at least two (2) days before requesting inspections. Affidavit forms are available at building permits department.

F. The Contractor shall verify location of existing utilities before commencing work, and care shall be taken to protect all utilities which are to remain.

G. Where space is limited, install components to maximize space available for maintenance and to maximize ease of removal for replacement.

H. Install work in such manner and sequence as to preclude cutting and patching wherever possible.

I. Install products only at the time and sequence, and under the environmental conditions that will insure best possible results.

J. In finished areas, conceal pipes, ducts, and wiring within construction, unless otherwise indicated.

3.04 INSTALLATION OF COMPONENTS

A. Install all products in accordance with manufacturer's instructions and recommendations, whether conveyed in the Contract Documents or not.

B. Where mounting heights are not indicated, and there is no guidance for mounting, obtain Architect’s instructions before proceeding.

C. Separate incompatible materials with suitable materials or spacing. Prevent cathodic corrosion.

D. Provide all anchors and fasteners required and use methods necessary to securely fasten work. In assemblies and installation, allow for thermal expansion and contraction, and for building movement.

E. After installation, adjust operating components to provide for proper operation.

F. The site shall remain secured for the duration of the Project.

3.05 CLEANING AND PROTECTION OF INSTALLATIONS

A. Keep the work site free of waste materials and debris; remove such waste periodically. Maintain level of cleanliness necessary for proper execution of the work. Where dust would impair execution of work, broom clean the entire area and keep clean.

B. Remove debris from concealed space prior to enclosing space.

C. Keep installed work clean, and clean again when soiled by other operations. Protect installed work from damage.
1. Provide protective coverings for work that may be damaged by subsequent operations. Where heavy abuse is expected, use minimum of plywood for protection.
2. Maintain protective coverings until Date of Substantial Completion.

3.06 SAFETY PRECAUTIONS AND REQUIREMENTS

A. Take precautions to prevent fires and to facilitate fire-fighting operations.
1. Store flammable materials in non-combustible containers, store away from potential fire sources; remove flammable waste regularly; provide adequate ventilation when using flammable or explosive substances.
2. Carefully supervise the operation of potential fire sources including on-site welding and cutting.
3. Keep temporary and permanent fire fighting facilities readily accessible; keep fire fighting routes open.

B. Take precautions to prevent accidents due to physical hazards.
1. Provide barricades, signs and warning lights as required to protect personnel and public from hazards and inform them thereof. Barricades and temporary safety railings shall comply with applicable safety regulations.
2. Provide and require use of safety equipment, clothing and accessories as required by the construction activity and applicable safety regulations. This is a hard hat job; protective headgear must be worn at all times in the construction period.

C. Take precautions to prevent pollution of air, water and soil.
1. Comply with government regulatory requirements for disposal of waste.
2. Do not dispose of volatile wastes such as petroleum products or other chemicals in storm or sanitary drains or on the grounds surrounding the Project site.
3. Do not handle or dispose of waste materials, debris, cleaning compounds or other chemicals in a manner that will be harmful to plant life on grounds adjacent to the Project site.
4. Comply with regulations and authorities having jurisdiction over safety and environmental standards affecting the Project.
5. Special care shall be taken to prevent newly constructed building phases from dust, mud or other material that may soil or stain the finished building materials.

D. Take precautions not to allow noxious fumes, gases, or excessive amounts of dust to leave the work area. Notify the Owner at least 24 hours in advance of any scheduled activities that might lead to such emissions.

E. Provide temporary supports and construction as required to prevent movement, collapse, or structural failure of the building, site work or any elements thereof.

END OF SECTION 01 73 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and other general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Description
2. Submittals
3. Materials
4. Examination prior to implementation
5. Preparation
6. Workmanship
7. Cutting
8. Patching
9. Cleaning

1.03 DESCRIPTION

A. Contractor shall be responsible for cutting, fitting and patching required to complete the Work including the following:
1. Making parts fit together properly.
2. Uncovering portions of the Work to provide for installation of ill-timed work or to accommodate inspections as required.
3. Removing and replacing defective work or work not conforming to requirements of Contract Documents.
4. Removing samples of installed work as specified for testing.

B. Costs incurred for ill-timed work or uncovering of work shall include costs for services of Owner’s consultants.

1.04 SUBMITTALS

A. Prior to cutting and patching of work in place, the Contractor shall submit a written proposal to the Architect. This proposal shall be submitted at least three days in advance of performing any cutting or alterations and shall meet the requirements set forth in this section.
1. The written proposal must be submitted in advance of any cutting that affects the following:
a. Work of Owner or any separate contract.
b. Structural elements of the Project.
c. Integrity or effectiveness of weather-exposed or waterproofed or moisture-resistant elements and systems.
d. Life expectancy, maintenance, efficiency or safety of operational elements.
e. Aesthetic qualities of visually exposed elements.

2. The Contractor shall include the following information in the proposal:
   a. Identification of Project.
   b. Description of affected work.
   c. Extent of cutting and patching and how it is to be performed; indication of why it cannot be avoided.
   d. Anticipated results in terms of changes to construction; including changes to other significant visual elements.
   e. Products proposed for use.
   f. Firms or entities that will perform the work.
   g. Utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
   h. Alternate methods, if applicable.
   i. Dates and times when cutting and patching work is to be performed.

3. Should conditions of the work or the schedule indicate a change of products from the original installation, Contractor shall submit a request for substitution as specified in Product Options and Substitutions Section.

B. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for patching and replacement of work removed: Comply with Specification Sections for type of work to be performed. Use materials identical to original installed materials. If identical materials cannot be used where exposed surfaces are involved, use materials that match original adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of original materials installed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to proceeding with work, examine Project conditions and surfaces to receive work including elements subject to damage or movement during cutting and patching operations. Take corrective action if unsafe or unsatisfactory conditions are encountered or anticipated.

B. After cutting, uncovering or removing, inspect conditions affecting installation of products or performance of further work. If unsatisfactory or questionable conditions are encountered, report such conditions in writing to Architect and do not proceed with work until Architect has provided further instructions.

3.02 PREPARATION

A. Temporary Supports: Provide adequate temporary supports for work to be cut and as necessary to insure the structural integrity of the affected portion of the work.

B. Protection:
   1. Protect adjacent construction during cutting and patching work to prevent damage. Provide all materials, devices and methods as required to protect work and adjacent surfaces.
   2. Take precautions necessary to avoid cutting operable pipes, conduits or ductwork serving the building including those scheduled to be removed or relocated until provisions have been made to bypass them.
   3. Protect portions of the work that may be exposed to the elements by cutting and patching.

3.03 WORKMANSHIP

A. Employ skilled workmen to perform cutting and patching work. To the greatest extent possible, retain installers or fabricators to perform cutting and patching work, especially for visually exposed finished surfaces and weather-exposed, waterproofed or moisture resistant elements.

B. Perform demolition and cutting work by methods that will not damage adjacent construction and will provide proper surfaces for patching work.

C. Execute work, by methods which will prevent settlement or damage to other work.

D. Elements of a structural or supporting nature, including those which are concealed and exposed after removal of work for repairs or patching, shall be inspected and the Architect notified should additional work be indicated due to loss of structural integrity, rot, rust, corrosion or other similar conditions.

E. Restore work that has been cut and removed so that completed Work is in accordance with requirements of Contract Documents. Perform all installations, fittings, and adjustments of materials or products to comply with manufacturers' product data, its intended functions, specified tolerances and finishes.

F. Fit restored work airtight around pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Refinish surfaces to provide an even, uniform finish to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish entire unit.

3.04 CUTTING

A. Perform cutting using methods least likely to damage adjoining construction or elements to be retained. Where possible, review proposed procedures with original installer; comply with original installer's recommendations.

B. Where cutting is required, use tools designed for sawing, cutting and grinding, not hammering or chopping. Cut openings neat to sizes required with minimum disturbances to adjacent surfaces. Cut or drill from exposed or finished side into concealed surfaces to avoid marring finished surfaces.

C. Perform cutting through concrete or masonry using cutting machines designed for this purpose such as carborundum saws or diamond core drills.

D. Where operable utility services are required to be removed, relocated or abandoned, bypass services such as pipes or conduits before cutting. Cut off pipes or conduits in walls or partitions to be removed; and cap, plug and seal remaining potions of pipe after by-passing.

3.05 PATCHING

A. Patch with methods and materials that are the least obvious. Restore exposed finishes of patched areas and adjacent areas in a manner that will be indistinguishable in the finished Work.

B. Where possible, inspect and test patched areas to demonstrate integrity of installation.

C. Gypsum wallboard hot patches are not allowed on this project. All patches shall be from stud to stud.

3.06 CLEANING

A. Clean areas and spaces where cutting and patching has been performed or where such work areas were accessed.

B. Remove excess paint, mortar, oils, putty or other items of similar nature from patched work and adjoining surfaces.

C. Restore any and all damaged or displaced insulation or coverings on pipe, ductwork or in walls or ceiling spaces.

END OF SECTION 01 73 29

SECTION 01 74 00
FINAL CLEANING

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Final cleaning of exterior and interior of project.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 – General Conditions.

B. Section 00 73 00 – Supplementary Conditions.

C. Section 01 77 00 – Contract Closeout.

D. Individual Specifications Sections: Specific cleaning for product or work.

1.03 DESCRIPTION

A. Execute cleaning prior to inspection for Substantial Completion of the Work.

1.04 DISPOSAL REQUIREMENTS

A. Remove and dispose of waste materials, rubbish, debris and trash in compliance with provisions of governing laws, codes, ordinances and regulations.
   1. Do not burn or bury rubbish, trash, debris and waste materials on Project site.

PART 2 – PRODUCTS

2.01 CLEANING MATERIALS

A. Use materials which will not create hazards to health or property, and which will not damage surfaces.

B. Use only materials and methods recommended by manufacturer of material being cleaned.

PART 3 – EXECUTION

3.01 PERIODIC CLEANING

A. On a regular and frequent basis during progress of Work, perform cleaning necessary to keep Work, Project site and adjacent properties free from unsightly and unsafe accumulation of scrap and waste materials, debris, rubbish and trash resulting from construction operations.
   1. Provide sufficient trash bins and containers for collection of scrap and waste material, debris, rubbish and trash.
   2. Provide separate, closable top metal containers for collection of oil and paint soaked rags; empty volatile substance cans and other waste products subject to spontaneous combustion.
   3. Designate approved eating areas and provide covered containers conforming to local health codes for collection of waste paper and leftover foodstuffs. Enforce usage of containers by workmen.

B. Dispose of scrap and waste materials, debris, rubbish and trash by one of the following optional methods:
   1. Provide services of company regularly engaged in refuse disposal operations, including usage of large metal dump-type trash containers.

2. Use own forces and equipment for loading, hauling and disposal.

C. Remove accumulations of scrap and waste materials as bins and containers are filled and not less than once per week.
1. Remove containers containing products subject to spontaneous combustion daily.
2. Remove containers containing waste paper and left-over foodstuff daily.
3. Legally dispose of all waste materials, rubbish, volatile materials and cleaning materials off Project site.
4. Dispose of no materials in waterways.

3.02 DUST CONTROL

A. During application of finished surface materials, including painting and decorating, employ dust control methods during cleaning operations to prevent dust from contaminating wet and freshly coated surfaces.

3.03 FINAL CLEANING

A. Prior to Substantial Completion of Work, or some designated portion thereof acceptable to Owner, perform cleaning of visually exposed materials, fixtures, equipment and finished surfaces.

B. Remove labels, tags, stickers and unauthorized identification markings from finished surfaces.
1. Do not remove permanently affixed nameplates, instructions, markings, Underwriters Laboratories labels and approval stickers, Factory Mutual approved stickers and other identifying markings required by federal, state and local codes, ordinances and regulations.

C. Remove broken, chipped and defective glass; remove stains, spots, marks, paint smears; dirt and foreign materials; clean and polish exterior and interior glass; clean and polish mirrors.

D. Remove temporary protective coatings, tapes and films from finished aluminum surfaces and ornamental metal surfaces, clean and polish aluminum and ornamental metal in compliance with manufacturer's instructions.

E. Remove paint smears, spots, marks, dirt, mud and dust from exposed interior and exterior finished surfaces.

F. Clean and polish finished hardware; remove marks, stains, scratches and blemishes.

G. Clean and polish ceramic floor and wall tile; clean and polish toilet fixtures and trim, toilet accessories and toilet compartments.

H. Sweep concrete floors not less than broom clean; vacuum where necessary to remove excessive dust; thoroughly clean other hard surfaced floors.
1. Remove mortar droppings, joint compound, plaster and cementitious material droppings from floors prior to final cleaning.

I. Sweep exterior paved surfaces broom clean; rake clean unpaved surfaces.

J. Thoroughly clean all items of mechanical and electrical equipment; remove excess oils and grease from exposed surfaces.
   1. Clean permanent filters and replace disposable filters if ventilating units were operated during construction.
   2. Clean ducts, blowers and coils if units were operated without filters during construction.

K. Vacuum clean carpeted and similar soft surfaces.

L. Clean, machine buff, wax and polish all resilient and hard-surfaced floors or as specified.

3.04 INSPECTION

A. Prior to occupancy by Owner of any designated portion of Work, conduct inspection in presence of Owner to verify Work is properly clean and ready for acceptance by Owner.

3.05 MAINTENANCE

A. Provide Owner with manufacturer written recommendations regarding cleaning and maintaining all interior finishes within the building.

END OF SECTION 01 74 00

SECTION 01 77 00
CONTRACT CLOSEOUT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operation and maintenance manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 33.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show percent completion for the portion of the Work claimed as substantially complete.
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
      b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
   2. Advise the Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
   4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Deliver tools, spare parts, extra stock, and similar items.
   6. Make final changeover of permanent locks and transmit keys to the Owner with a written acceptance letter from the Owner and copied to the Architect. Advise the Owner's personnel of changeover in security provisions.
   7. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Upon completion of Owner system operation instructions list the systems instructed on a letter form and have the Owner sign the written acceptan2e letter and copy the Architect on executed document. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.

B. Substantial Completion Walk Through Procedures: The Contractor shall submit a punch list performed by the project superintendent for review by the Architect. On receipt of a request for substantial completion walk through, the Architect will either schedule the walk through or advise the Contractor of unfilled contract requirements to perform the walk through. The

Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

C. Should status of completion of Work require re-inspection by Architect/Engineer due to failure of Work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect/Engineer compensation for re-inspection services from final payment to Contractor.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Submit Record Documents in accordance with this section.
8. Submit Operations and Maintenance Manuals in accordance with this section.
9. Submit Warranty Manual in accordance with Section 01 78 40.

B. Re-inspection Procedure: Should status of completion of Work require re-inspection by Architect/Engineer due to failure of Work to comply with Contractor's claims for final inspection, Owner will deduct the amount of Architect/engineer compensation for re-inspection services from final payment to Contractor.

1.5 RECORD DOCUMENT GENERAL REQUIREMENTS

A. In addition to requirements in General Conditions, Maintain at the site for Owner, two (2) record copies of:
1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Approved shop drawings, product data, and samples.
6. Field test records.
7. Inspection certificates.
8. Manufacturer's certificates.

B. Store Record Documents and samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.

C. Label and file Record Documents and samples in accordance with Section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.

E. Keep Record Documents and samples available for inspection by Architect/Engineer.

1.6 RECORDING PROCEDURES FOR RECORD DOCUMENTS

A. Record information on a set of black line bond paper drawings, and in a copy of a Project Manual. Label each sheet of the Project Record Drawings in the lower right corner with the neatly printed or stamped words "Project Record Drawings."

One (1) set of Contract Documents and Drawings will remain clean without mark-up for record purposes. Contractor shall use the additional set for marking measurements, on-site changes, items of construction that are actually used, and other conditions as they are encountered during the course of the Work. This marked-up set of Contract Documents and Drawings shall consist of red-lined copies of plans and shop drawings, shall indicate actual field dimensions, shall represent the work as actually constructed, and shall be recorded on a daily basis. Failure to produce these records on request of Architect or Owner shall constitute grounds to hold construction progress payments until steps are taken to see that these records are being properly made. This marked up set may be one (1) of the three (3) required as part of Final Inspection procedures.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

1. The Construction Manager shall provide colored pencils for marking record copies of Contract Drawings and Specifications. Use a different colored pencil for each of the following:
   a. Architectural Work — Red
   b. Plumbing Work — Green
   c. HVAC Work — Blue
   d. Electrical Work — Orange
   e. Other written notations — Brown
2. Establish a color code denoting what trade will use what color, and show this on a schedule on the front sheet of the "PROJECT RECORD DOCUMENTS."

C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

D. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

1. Measured depths of elements of foundation in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
4. Field changes of dimension and detail.
5. Changes made by Modifications.
6. Details not on original Contract Drawings.
7. References to related shop drawings and Modifications.

1.7 RECORD DOCUMENT SUBMITTALS

A. Prior to submittal of final three (3) copies of record drawings and shop drawing manuals, General Contractor shall submit preliminary versions of each to the Architect for review. **This submittal must occur ten (10) days prior to Substantial Completion.** Contractor must receive comments from Architect prior to assembling final copies of manual.

B. **Prior or concurrent to final construction inspection**, Contractor shall furnish to Architect three (3) neatly marked sets of construction plans three (3) copies of which accurately depict the conditions and records all changes made during construction. Architect shall promptly notify Contractor in writing if additional information is required.

C. Shop Drawing Manuals: Organize shop drawing data into suitable sets of manageable size. Organize and divide shop drawings in sequential order as outlined by the project manual Table of Contents. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, tabs and pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder.

1.8 OPERATION AND MAINTENANCE MANUALS – GENERAL

A. **Prior to substantial completion inspection**, compile product data and related information appropriate for Owner's maintenance and operation of products furnished under work of this contract. Provide three (3) copies of this information to assemble into three (3) reference manuals.

B. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; one-inch maximum ring size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, tabs and pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; identify subject matter of contents.

D. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer’s printed data, or typewritten data on 24 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.9 CONTENTS – OPERATIONS AND MAINTENANCE MANUALS

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Bind in additional copy of each as specified in Section 01 78 40.

1.10 SECTIONS FOR MATERIALS AND FINISHES

A. As part of O&M manual, provide tabbed sections for materials and finishes. Organize sections according to project manual Table of Contents.

B. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

C. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

D. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

E. Additional Requirements: As specified in individual product specification Sections.

1.11 SECTIONS FOR EQUIPMENT AND SYSTEMS

A. As part of O&M manual, provide individually tabbed sections for equipment and systems. Organize sections according to project manual Table of Contents.

B. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

D. Include color-coded wiring diagrams as installed.

E. Written Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Written Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer’s spare parts, current prices, and recommended quantities to be maintained in storage.

O. Additional Requirements: As specified in individual product specification Sections.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:
   1. Startup.
   2. Shutdown.
   3. Emergency operations.
   4. Noise and vibration adjustments.
   5. Safety procedures.
   6. Economy and efficiency adjustments.
   7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section "Construction Facilities & Temporary Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
      a. Remove labels that are not permanent labels.
      b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
      c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
      d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
      e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
      f. Prior to Substantial Completion of Work, or some designated portion thereof acceptable to Owner, perform cleaning of visually exposed materials, fixtures, equipment and finished surfaces.
      g. Remove labels, tags, stickers and unauthorized identification markings from finished surfaces.
         1. Do not remove permanently affixed nameplates, instructions, markings, Underwriters Laboratories labels and approval stickers, Factory Mutual approved stickers and other identifying markings required by federal, state and local codes, ordinances and regulations.
      h. Remove broken, chipped and defective glass; remove stains, spots, marks, paint smears; dirt and foreign materials; clean and polish exterior and interior glass; clean and polish mirrors.
      i. Remove temporary protective coatings, tapes and films from finished aluminum surfaces and ornamental metal surfaces, clean and polish aluminum and ornamental metal in compliance with manufacturer's instructions.
      j. Remove paint smears, spots, marks, dirt, mud and dust from exposed interior and exterior finished surfaces.
      k. Clean and polish finished hardware; remove marks, stains, scratches and blemishes.

l. Clean and polish ceramic floor and wall tile; clean and polish toilet fixtures and trim, toilet accessories and toilet compartments.

m. Sweep concrete floors not less than broom clean; vacuum where necessary to remove excessive dust; thoroughly clean other hard surfaced floors.

1. Remove mortar droppings, joint compound, plaster and cementitious material droppings from floors prior to final cleaning.

n. Sweep exterior paved surfaces broom clean; rake clean unpaved surfaces.

o. Thoroughly clean all items of mechanical and electrical equipment; remove excess oils and grease from exposed surfaces.

1. Clean permanent filters and replace disposable filters if ventilating units were operated during construction.

2. Clean ducts, blowers and coils if units were operated without filters during construction.

p. Vacuum clean carpeted and similar soft surfaces.

q. Clean, machine buff, three (3) coats of wax and polish all resilient and hard-surfaced floors as specified by manufacturer's recommendations.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

SECTION 01 77 00
CONTRACT CLOSEOUT

PROJECT CLOSE OUT

CHECK-OFF LIST

PROJECT NAME **Gillem Public Safety Building**

PROJECT NUMBER **A21-006**

DOCUMENT**	NO. OF COPIES	DATE RECEIVED
Contractors Warranty		
Statutory Affidavit		
Non-Influence Affidavit		
INSPECTION REPORTS		
County Building Inspector		
County Plumbing Inspector		
County Electrical Inspector		
Fire Marshal-Occupancy Certificates		
Consent of Surety to Final Payment		
Contractors Affidavit - Release of Liens		
Equipment Instructions Release		
Other as specified - (Fill in):		

MAINTENANCE MANUALS & EQUIPMENT BROCHURES**

Air Conditioning Equipment		
Boilers		
Water Heaters		
Plumbing Fixtures		
Electrical Equipment		
Food Service Equipment		
Cold Storage Equipment		
Test and Balance Reports		
Wiring and Controls Diagrams for Equipment		
Other as specified - (Fill in):		

KEYS

Schedule by Door Locations		
Certificate of Receipt of Keys		
Schedule of Value tags, Location & Function		

**Where Applicable by Specification

Gillem Public Safety Building
Forest Park, Georgia

_____, Contractor for the above-referenced project, and the County of Clayton, Owner, hereby certify that "as-built" drawings for the above-referenced project have been prepared by the Contractor and provided to the Owner. The Owner and Contractor further certify that the Contractor has provided the owner with all maintenance and operation instructions, and product warranties, and that the Owner, or Owner's representative has been trained in the maintenance and operations of the systems installed.

The Owner and the Contractor understand that the Contractor's warranty for the project begins on the date of substantial completion and remains in effect for a period of one (1) year. The Owner understands that he/she shall direct warranty concerns to the Contractor, during this warranty period and to the product manufacturers for warranties beyond this time period.

If the Contractor, after notice, fails to proceed within seven (7) days to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his surety shall be liable for all expense incurred.

_____

Contractor Date

_____

County of Clayton Date

_____

Precision Planning, Inc. Date

SECTION 01 77 00
CONTRACT CLOSEOUT

NON-INFLUENCE AFFIDAVIT

CITY OF _____

STATE OF _____

I do solemnly swear on my oath that as to the contract dated _____, 20_____,

between _____ and the

_____

I have no knowledge of the exertion of any influence or the attempted exertion of any influence on the firm on behalf of which this affidavit is made in any way, manner, or form in the purchase of materials, equipment, or other items involved in construction, manufacturer, or employment of labor under the aforesaid contract by any employee, officer, or agent of _____,
or any person connected with the State Government of Georgia in any way whatsoever.

This _____ day of _____, 20___.

_____
Signature

_____
Title

_____
Firm

CITY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____, who is known to me to be an official of the firm of _____, who, after being duly sworn, stated on his oath that he had read the above statement and that the same is true and correct.

_____
Notary Public

My commission expires _____

This _____ day of _____, 20____.

SECTION 01 77 00
CONTRACT CLOSEOUT

STATUTORY AFFIDAVIT

CITY OF: _____
STATE OF: _____
FROM: _____
(Contractor)
To: _____
(Owner)

Re: Contract entered into the _____ day of _____, 20___, between the above-mentioned parties for the construction of a _____
at _____

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned hereby certifies that all work required under the above contract has been performed in accordance with the terms thereof, that all materialmen, subcontractors, mechanics, and laborers have been paid and satisfied in full, and that there are no outstanding claims of any character [including disputed claims or any claims to which the contractor has or will assert any defense] arising out of the performance of the contract which have not been paid and satisfied in full except as listed herein below:

2. The undersigned further certifies that to the best of his knowledge and belief there are no unsatisfied claims for damages resulting from injury or death to any employees, subcontractors, or the public at large arising out of the performance of the contract, or any suits or claims for any other damage of any kind, nature, or description which might constitute a lien upon the property of the owner.

3. The undersigned makes this affidavit as provided by law and for the purpose of receiving final payment in full settlement of all claims against the owner arising under or by virtue of the contract, and acceptance of such payment is acknowledged as a release of the owner from any and all claims arising under or by virtue of the contract.

This _____ day of _____, 20___.

_____
Signature

_____
Title

_____
Firm

CITY OF _____
STATE OF _____

Personally before me, the undersigned authority, appeared _____, who is known to me to be an official of the firm of _____, who, after being duly sworn, stated on his oath that he had read the above statement and that the same it true and correct.

_____
Notary Public
My commission expires _____

This _____day of _____, 20____

END OF SECTION 01 77 00

SECTION 01 78 20
OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:
   1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
   2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.
   3. Instruction of the Owner’s operating personnel in the operation and maintenance of building systems and equipment.

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Division 1 Section, Submittals, specifies preparation of Shop Drawings and Product Data.
   2. Division 1 Section, Contract Closeout, specifies general closeout requirements.
   3. Division 1 Section, Project Record Documents, specifies record document requirements.
   4. Appropriate Sections of Divisions 2 through 33 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.03 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.
   1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
   2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.

1.04 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:
   1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit a draft copy of each manual to the Architect for review. Include a complete index or table of contents of each manual. The Architect will return the draft with comments within 15 days of receipt.
   2. Contractor must incorporate all of Architect’s revisions and comments and submit final acceptable operations and maintenance manuals to Architect prior to requesting Final Completion on the Project.

B. Form of Submittal: **Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel and two (2) electronic version in PDF format.** Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.
    a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
    b. Identify each binder on front and spine, with the printed title "Operation and Maintenance Manual," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.
2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the section on each divider.
3. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch white bond paper.
4. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.
    a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
    b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.05 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable shop drawings and product data.
4. System or equipment identification, including:
    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.
5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.

14. Manual index.

B. Organize each manual into separate sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of product data, supplemented by drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:
   a. Subject matter covered by the manual.
   b. Name and address of the Project.
   c. Date of submittal.
   d. Name, address, and telephone number of the Contractor.
   e. Name and address of the Architect.
   f. Cross-reference to related systems in other operation and maintenance manuals.
2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.
   a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.
3. General Information: Provide a general information section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.
4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.
5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.
6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.
   a. Do not use original Project Record Documents as part of operation and maintenance manuals.
7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.06 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. **Submit two (2) copies of each manual and one (1) electronic PDF**, in final form, on material and finishes to the Architect for distribution. Provide one section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.
   1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.
   1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:
      a. Manufacturer's catalog number.
      b. Size.
      c. Material composition.
      d. Color.
      e. Texture.
      f. Reordering information for specially manufactured products.
   2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to the Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.
   1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
      a. Applicable standards.
      b. Chemical composition.
      c. Installation details.
      d. Inspection procedures.
      e. Maintenance information.
      f. Repair procedures.

D. Schedule: Provide complete information in the materials and finishes manual on products specified in the following sections:

1.07 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. **Submit two (2) copies of each manual and one (1) electronic PDF**, in final form, on equipment and systems to the Architect for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.
   1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.
   1. Description: Provide a complete description of each unit and related component parts, including the following:
      a. Equipment or system function.
      b. Operating characteristics.
      c. Limiting conditions.
      d. Performance curves.

e. Engineering data and tests.
f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:
   a. Printed operation and maintenance instructions.
   b. Assembly drawings and diagrams required for maintenance.
   c. List of items recommended to be stocked as spare parts.
3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:
   a. Routine operations.
   b. Troubleshooting guide.
   c. Disassembly, repair, and reassembly.
   d. Alignment, adjusting, and checking.
4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:
   a. Startup procedures.
   b. Equipment or system break-in.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Instructions on stopping.
   f. Shutdown and emergency instructions.
   g. Summer and winter operating instructions.
   h. Required sequences for electric or electronic systems.
   i. Special operating instructions.
5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
7. Coordination Drawings: Provide Contractor's coordination drawings.
   a. Provide as-installed, color-coded, piping diagrams, where required for identification.
8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.
9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:
   a. Electric service.
   b. Controls.
   c. Communication.

C. Schedule: Provide complete information in the equipment and systems manual on products specified in the following sections:

1.08 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

A. Refer to Section 01 81 50 System Demonstration and Training for additional requirements.

B. Prior to the Date of Substantial Completion, instruct personnel designated by the Owner in the operation and maintenance of equipment and systems.
   1. Systems shall include but not necessarily be limited to:
      a. HVAC
      b. Electrical power and lighting
      c. Plumbing and fire protection
      d. Fire alarms
      e. Elevator

f. Security/CCTV/AV and other low voltage items as required

2. For equipment and operable systems, explain all modes of operation. Demonstrate all functions, including startup, operation, control, adjustment, shutdown, servicing, and maintenance.
3. For other building elements and systems describe the installation and indicate manufacturers directed or otherwise preferred means of cleaning, servicing, maintaining or repairing.
4. Review terms of warranties and procedures for obtaining warranty service.
5. Have operating and maintenance data available for use during instruction. Review contents with Owner's personnel. Prepare and insert additional data when need becomes apparent during instruction.

C. Arrange times and places for instruction with Owner. Provide instruction by qualified personnel of Contractor, their subcontractor, or applicable manufacturer's representative.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 78 20

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintenance of Record Documents and Samples.

B. Submittal of Record Documents and Samples.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 – Submittals: Shop drawings, product data, and samples.

B. Section 01 77 00 – Contract Closeout.

C. Section 01 78 20 – Operation and Maintenance Data.

D. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. In addition to requirements in General Conditions, Maintain at the site for Owner, two (2) record copies of:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Approved shop drawings, product data, and samples.
6. Field test records.
7. Inspection certificates.
8. Manufacturer's certificates.

B. Store Record Documents and samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.

C. Label and file Record Documents and samples in accordance with Section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.

E. Keep Record Documents and samples available for inspection by Architect/Engineer at monthly meetings.

1.04 RECORDING

A. Record information on a set of black line drawings and in a copy of a Project Manual. Label each sheet of the Project Record Drawings in the lower right corner with the neatly printed words "Project Record Drawings."

One (1) set of Contract Documents and Drawings will remain clean without mark-up for record purposes. Contractor shall use the additional set for marking measurements, on-site changes, items of construction that are actually used, and other conditions as they are encountered during the course of the Work. This marked-up set of Contract Documents and Drawings shall consist of redlined copies of plans and shop drawings, shall indicate actual field dimensions, shall represent the work as actually constructed, and shall be recorded on a daily basis. Failure to produce these records on request of Architect or Owner shall constitute grounds to halt construction with no time extension until steps are taken to see that these records are being properly made.

B. Provide felt-tip marking pens, maintaining separate colors for each major system, for recording information.

1. The Construction Manager shall provide colored pencils for marking record copies of Contract Drawings and Specifications. Use a different colored pencil for each of the following:
   a. Architectural Work — Red
   b. Plumbing Work — Green
   c. HVAC Work — Blue
   d. Electrical Work — Orange
   e. Other written notations — Brown
2. Establish a color code denoting what trade will use what color, and show this on a schedule on the front sheet of the "PROJECT RECORD DOCUMENTS."

C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

D. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

1. Measured depths of elements of foundation in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
4. Field changes of dimension and detail.
5. Changes made by Modifications.
6. Details not on original Contract Drawings.
7. References to related shop drawings and Modifications.

E. Prior to final construction inspection, Contractor shall furnish to the Architect a neatly marked set of construction plans which accurately depict the conditions and records all

changes made during construction. Architect shall promptly notify Contractor in writing if additional information is required.

F. Other Documents: Maintain manufacturer's certifications, inspection certifications, and field test records, required by individual Specifications sections.

1.05 SUBMITTALS

A. At Contract Closeout, deliver Record Documents and samples under provisions of Section 01 77 00.

B. Transmit with cover letter in duplicate, listing:

1. Date.
2. Project title and number.
3. Contractor's name, address, and telephone number.
4. Number and title of each Record Document.
5. Signature of Contractor or authorized representative.

PART 2 – PRODUCTS (Not Used.)

PART 3 – EXECUTION (Not Used.)

END OF SECTION 01 78 39

SECTION 01 78 40
WARRANTIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section Contract Closeout, specifies contract closeout procedures.
2. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.
3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 DEFINITIONS

A. Contractor's Warranty: Contractor shall provide a warranty on the Project that warrants that all labor and materials furnished and work performed are in accordance with the Contract Documents and will be free from defects due to defective materials and/or workmanship for a period of one year from the Date of Substantial Completion. Warranty shall be provided on the form provided in this Specification Section.

B. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.04 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
   1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the work or part of the work, the Owner reserves the right to refuse to accept the work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.05 SUBMITTALS

A. Submit written warranties to the Architect effective on the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution. Refer to Specifications Divisions 2 through 33 for specific Contract requirements and particular requirements for submitting special warranties.

C. Form of Submittal: **Compile two (2) hard copies and one (1) electronic copy** of each required warranty properly executed by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
   2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.

3. Provide additional copies of each required warranty, as necessary, for inclusion in each required Operations and Maintenance Manual.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 LIST OF WARRANTIES

A. Schedule: Provide warranties on products and installations as specified in the following Sections:

All utilized Sections 1 through 33 as indicated.

3.02 CONTRACTOR'S WARRANTY

A. The format of submission of the Contractor's Warranty is included on the subsequent page in this Specification Section.

CONTRACTOR WARRANTY FORM

PROJECT:

LOCATION:

OWNER:

We, _____, Contractor
(Contractor's Name)

for the above referenced project, do hereby warrant that all labor and materials furnished and work performed are in accordance with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials and/or workmanship for a period of one year from the Date of Substantial Completion. This Warranty commences on:

_____
(Date of Substantial Completion)

and expires on:

_____
(One Year from Commencement Date)

Should any defect develop during the warranty period due to improper materials, workmanship or arrangement; the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give the Contractor written notice of defective work. Should Contractor fail to correct defective work within sixty (60) days after receiving notice, the Owner may at its option, correct defects and charge Contractor costs for such correction. Contractor agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work that has been abused or neglected by the Owner or that was installed by another contractor.

For:_____
(Company Name)

By:_____

Title:_____

Date:_____

END OF SECTION 01 78 40

SECTION 01 81 50
SYSTEM DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 The work of this section consists of demonstrating systems and equipment to operating personnel. It also includes training of personnel.

1.02 COORDINATION

A. Schedule demonstrations and training periods with Owner. Conduct training sessions after the equipment or system has been fully completed and operational, approved by inspections of manufacturer and/or authorities having jurisdiction as required. Schedule and provide training by manufacturer's representatives where required and as requested at no additional cost to the Owner.

B. Training Schedule: This schedule lists the minimum system requirements for training and demonstration.

1. Overhead Sectional and Four-Fold Apparatus Bay Doors and Controls
2. Mechanical Equipment and Controls Systems
3. Electrical and Lighting equipment and Controls Systems
4. Fire Alarm Systems
5. Plumbing and fire protection
6. Security/CCTV/AV and other low voltage systems as required
7. Site Gate Operator and Controls
8. Food Service Equipment
9. Commercial Laundry Equipment
10. Miscellaneous Equipment
11. Solar Shade

1.03 CLOSEOUT SUBMITTALS

A. As specified in Specification Section 01 77 00.

B. For each training session, the Contractor shall submit for approval a proposed outline of the subjects to be covered. The training shall not be conducted until the outline is approved.

C. Recordings of demonstrations and training sessions:

1. Provide original and one (1) copy of each DVD.
2. Label each DVD with the date of demonstration or training, the instructor's name, and provide an index of the contents. The index shall list the start and end time of each subject covered during the training session. The sequence of the training subjects shall follow the sequence listed in the approved training outline or as actually conducted.
3. Provide a separate DVD for each separate training session.

PART 2 – PRODUCTS

2.01 MEDIA REQUIREMENTS

A. DVD format.

PART 3 – EXECUTION

3.01 TRAINING

A. As specified herein and in individual sections, furnish the services of instructors to train designated personnel in adjustment, operation, including seasonal and emergency operations, if applicable, maintenance, and safety requirements of equipment and systems. Instructors shall be thoroughly trained in operating theory as well as practical operation and maintenance work for each type of equipment or system. The sequence of the training shall follow the approved training outline.

B. Individual sections specify the duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover the subjects. When more than four (4) days of instruction are specified, use approximately one-half of the time for classroom and the other half for hands-on instruction with the equipment or system.

C. Use Operating and Maintenance Data as a training guide.

3.02 TAPING/RECORDING

A. Document all of the above sessions at the recording speed which produces the highest resolution picture. The instructor's voice shall be clearly audible and understandable on the recording. Utilize a supplemental microphone worn by the instructor.

B. DVD’s with poor video or audio quality will be rejected and the training re-recorded.

END OF SECTION 01 81 50

SECTION 02 40 00

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of site improvements a.
   2. Removing below-grade construction.
   3. Disconnecting, capping or sealing, and removing site utilities in designated areas.

B. Related Sections include the following:

   1. Division 1 “Summary” Section for use of the premises and phasing requirements.
   2. Division 31 Section "Clearing and Grubbing" for site clearing and removal of above- and below-grade improvements not part of building demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, or removed and salvaged.

1.4 SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes (if applicable) by a landfill facility licensed to accept hazardous wastes.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition of building type, materials and scope similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

A. Contractor shall be responsible for demolition of all existing structures, utilities and site improvements on site.

B. Notify Owner of discrepancies between existing conditions and Drawings before proceeding with demolition.
   1. Confirm with Owner if any items will be salvaged and returned to Owner prior to beginning demolition operations.

C. Storage or sale of removed items or materials on-site will **not** be permitted.

D. Utility Service: Mark all utilities. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

E. Conduct demolition so that traffic flow around site will not be disrupted.

F. Owner assumes no responsibility for actual condition of items to be demolished.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required. Owner does not guarantee that existing conditions are the same as those indicated on the site survey.

B. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Architect.

2.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

B. Existing Utilities: Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

   1. Strengthen or add new supports when required during progress of demolition.

2.3 PROTECTION

A. Existing Utilities: Maintain utility services indicated to remain and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

B. Temporary Protection: Erect temporary protection, such as walks, fences, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section 01 50 00, "Temporary Facilities, Controls, and Services."

1. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
2. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
3. Provide protection to ensure safe passage of people around demolition area and to and from occupied adjacent buildings and structures.

2.4 DEMOLITION, GENERAL

A. General: Demolish indicated structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

B. Site Access and Temporary Controls: Conduct debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

2.5 MECHANICAL DEMOLITION

A. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven saw, then remove concrete between saw cuts.

B. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

2.6 EXPLOSIVE DEMOLITION

A. Explosives: Use of explosives is not permitted.

2.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation, or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

2.8 REPAIRS

A. General: Promptly repair any damage to adjacent construction caused by demolition operations.

2.9 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

2.10 CLEANING

A. Clean site and any existing improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 02 40 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Spread and strip footings.
2. 4”, 6”, and 8” Slabs-on-grades.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Water withheld for later addition at Project site is not permitted.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Samples: For waterstops and vapor retarder.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.

G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

H. Minutes of pre-installation conference.

I. Slab-on-grade joint layout drawings: Dimensioned plan drawings indicating location and frequency of control construction joints in slab-on-grade pursuant to the guidelines in the structural contract drawings.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction**,** qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete".
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318, "Building Code Requirements for Structural Concrete."

E. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, shoring and re-shoring procedures, vapor-retarder installation, steel reinforcement installation, and concrete protection.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Precast concrete supports are acceptable for on-ground applications. For elevated slab areas, precast concrete supports are not permitted.

B. Mechanical Terminators and Splices: Mechanical terminators and splices shall meet building code requirements. Terminators and splices shall be a positive locking, taper threading type anchor manufactured from high quality steel. The ends of reinforcing shall be tapered using the manufacturer’s threading equipment to ensure proper taper and thread engagement. Reinforcing, terminators, and splices shall be installed pursuant to manufacturer’s requirements.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, or Type I/II.
2. No other cementitious materials are permitted.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded.

1. Maximum Coarse-Aggregate Size: 1 ½ inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.06 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, to meet or exceed all requirements for Class A, Class B, and Class C. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.07 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Curing compound must be compatible with glue agent utilized for VCT.

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

1. All exterior expansion joint material shall be “zip strip” type with caulked joints.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.09 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. All Building Elements, except those otherwise noted: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.55.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 4.5 percent, plus or minus 1.0 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

B. Generator Pad, 6” and 8” Slab on Grade:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 4.5 percent, plus or minus 1.0 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

D. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or re-shoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate re-shoring to support construction without excessive stress or deflection.

3.05 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Use of chairs or bolster is appropriate for placement of welded wire fabric. Fabric laid on grade or bottom of form to be “pulled up” after concrete is in place will not be permitted.

3.07 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade or suspended slabs. At suspended slabs, levelness measurements only apply to slabs which are shored at time of testing.
    b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade at gymnasium or other areas to receive wood or athletic flooring.

3. Measurements of F(F) and F(L) shall be made as soon as possible, preferably within 24 hours, but not later than 72 hours after placement of slabs-on-grade, and prior to removal of formwork and shoring for suspended slabs.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

E. All slab areas where epoxy floor systems are specified shall be flood tested prior to the installation of epoxy coating.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days. Retain first three subparagraphs below as Contractor's options unless not suited for Project.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.
   a. Cast and laboratory cure a minimum of four cylinder specimens for each composite sample.
   b. Cast and laboratory cure two additional cylinder specimens as necessary for determining early strength for formwork or shoring considerations or for reserve usage.

7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and one set of two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
15. Contractor shall provide a secure, protected curing box for the storage of concrete cylinders.

END OF SECTION 03 30 00

SECTION 03 41 00

STRUCTURAL PRECAST CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the performance criteria, materials, design, production, and erection of structural precast and precast, prestressed concrete for the entire project. The work performed under this Section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the structural precast and precast, prestressed concrete work shown on the Contract Drawings.

B. This Section includes the following:

1. Architectural Precast Concrete Load Bearing Units
2. Precast Roof Units.
3. Beams, columns, double tees.
4. Walls, spandrels.

C. Related Sections include the following:

1. Section 03 30 00 “Cast-in-Place Concrete” for installing connection anchors and reinforcing steel in concrete and structural topping.
2. Section 05 50 00 “Metal Fabrications” for furnishing and installing loose hardware items.
3. Section 07 15 00 “Sheet Metal Flashing and Trim” for flashing receivers and reglets.
4. Section 07 84 00 “Firestopping”, Through-Penetration Firestop Systems for joint filler materials for fire-resistance-rated construction.
5. Section 07 92 00 “Joint Sealants” for elastomeric joint sealants and sealant backings between slab edges at exposed underside of floor and roof members and/or perimeter of members.
6. Section 09 91 00 “Painting.”

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide structural precast concrete members and connections capable of withstanding design loads indicated within limits and under conditions indicated on Drawings.

1. Design structural precast concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain structural precast concrete deflections within limits of ACI 318.

2. Thermal Movements: Provide for thermal movements noted.
   a. The precast system design shall consider the maximum seasonal climatic temperature change.
   b. In plane thermal movements of individual members directly exposed to the sun shall consider a temperature range of 34 degrees F to 90 degrees F.
   c. Member connection design shall consider through thickness thermal gradients as appropriate.

3. Fire Resistance Rating: Provide components to meet the following fire ratings:
   a. Roof: 1 HR
   b. Demising Walls: 2 HR
   c. Exterior Walls: 1 HR

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Retain quality control records and certificates of compliance for five (5) years after completion of structure.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength.

C. Shop (Erection) Drawings:

1. Detail fabrication and installation of structural precast concrete units including connections at member ends and to each adjoining member.
2. Indicate locations, plan views, elevations, dimensions, shapes, and cross sections of each unit, openings, support conditions and types of reinforcement, including special reinforcement.
3. Indicate aesthetic intent including joints, rustications or reveals, and extent and location of each surface finish.
4. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
5. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
7. Include and locate openings larger than 10 in. Where additional structural support is required for openings include header design.
8. Coordinate and indicate openings and inserts required by other trades.
9. Indicate location of each structural precast concrete member by same identification mark placed on unit.
10. Indicate relationship of structural precast concrete members to adjacent materials.
11. Indicate locations and details of joint treatment.
12. Indicate areas receiving toppings and magnitude of topping thickness.
13. Indicate estimated cambers for floor slabs receiving cast-in-place topping.
14. Indicate shim sizes and grouting sequence.
15. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, notify the Architect and submit design calculations and Shop Drawings. Do not affect the appearance, durability or strength of members when modifying details or materials. Maintain the general design concept when altering size of members and alignment.

D. Provide handling procedures, erection sequences, and for special conditions provide temporary bracing and shoring plan.

E. Comprehensive engineering design signed and sealed by a qualified professional engineer responsible for its preparation licensed in Georgia.

F. Qualification Data: For installer, fabricator and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel certification.

H. Material Test Reports for aggregates: From an accredited testing agency, indicating and interpreting test results for compliance with requirements indicated.

I. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.
6. Other components specified in Contract Documents with applicable standards.

J. Field quality-control test reports.

K. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of four (4) sample panels approximately 16 ft^2 in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels. Interior face of mockup shall be prepared so as to set the standard of finish on the interior wall face in areas concrete will remain exposed or receive paint.

1. Locate panels where indicated in Contract Document or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at the fabricator’s plant and one at the Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

L. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Mockups to be representative of the finished work including cabling, brick, textures and sealants and architectural precast concrete complete with anchors, connections, flashings, and joint fillers as accepted on the final Shop Drawings. Build mockups to comply with the following requirements, using materials indicated for the completed work:

1. Build mockups in the location and of the size indicated in Contract Documents or, if not indicated, as directed by Architect.
2. Notify Architect in advance of dates and times when mockups will be constructed.
3. Obtain Architect's approval of mockups before starting fabrication of precast concrete units.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove mockups when directed.
6. Approved mockups may become part of the completed Work if undamaged at the time of Substantial Completion.
7. Approval of mockups does not constitute approval of deviations from the Contact Documents unless such deviations are specifically approved by Architect in writing

1.05 QUALITY ASSURANCE

A. Erector Certification: A precast concrete erector with erecting organization and all erecting crews Certified and designated, prior to beginning work at project site, by PCI’s Certificate of Compliance to erect Category S2 Complex Structural Systems for load-bearing members.

B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in producing structural precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Assumes responsibility for engineering structural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
2. Professional Engineer Qualifications: A professional engineer licensed in Georgia and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of structural precast concrete that are similar to those indicated for this Project in material, design, and extent.
3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C3 – Prestressed Straight-Strand Structural Members.
4. Has sufficient production capacity to produce required members without delaying the Work.
5. Certification shall be maintained throughout the production of the precast concrete units. Production shall immediately stop if at any time the fabricator's certification is revoked, regardless of the status of completion of contracted work. Production will not be allowed to re-start until the necessary corrections are made and certification has been re-established. In the event certification(s) cannot be re-established in a timely manner, causing project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PCI certified plant.

C. Testing Agency Qualifications: An independent accredited testing agency, acceptable to Authorities having jurisdiction qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated.

D. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of structural precast concrete members indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for types of members required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Concrete Products."

1. Comply with camber and dimensional tolerances of PCI MNL 135, "Tolerance Manual for Precast and Prestressed Concrete Construction."

F. Product Options: Drawings indicate size, profiles and dimensional requirements of precast concrete members and are based on the specific types of members indicated. Other fabricators' precast concrete members complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code – Steel"; AWS D1.4, "Structural Welding Code – Reinforcing Steel"; and AWS D1.6, "Structural Welding Code-Stainless".

H. Fire Resistance: Where indicated, provide structural precast concrete members whose fire resistance satisfy the fire resistance ratings of the Contract Documents and meets the prescriptive requirements of the governing code or has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Coordination."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver all structural precast concrete members in such quantities and at such times to assure compliance with the agreed upon project schedule and setting sequence to ensure continuity of installation.

B. Handle and transport members in a manner to avoid excessive stresses that could cause cracking or other damage.

C. Store units with adequate dunnage and bracing, and protect units to prevent contact with soil, staining, and to control cracking, distortion, warping or other physical damage.

D. Unless otherwise specified or shown on Shop Drawings, store members with dunnage across full width of each bearing point.

E. Place stored members so identification marks are clearly visible, and units can be inspected.

F. Place dunnage of even thickness between each member.

G. Lift and support members only at designated points indicated on the Shop Drawings.

1.07 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 – PRODUCTS

2.01 FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide products by one of the following:

1. Metromont Corporation (Basis of Design)
2. Atlanta Structural Concrete Company
3. Tindal Corporation

2.02 FORM MATERIALS

A. Forms: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required surface finishes.

1. Form-Release Agent: Commercially produced form-release agent that will not bond with, stain or affect hardening of precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.03 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60, deformed bars, assembled with clips.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, or ASTM A 1064, fabricated from steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, or ASTM A 1064, flat sheet.

E. Supports: Use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.04 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416, Grade 250 or Grade 270, uncoated, 7-wire, low-relaxation strand or ASTM A 886, Grade 270, indented, 7-wire, low-relaxation strand (including supplement).

B. Unbonded Post-Tensioning Strand: ASTM A 416, Grade 270, 7-wire, low-relaxation strand with corrosion inhibitor conforming to ACI 423.7, with polypropylene tendon sheathing. Include anchorage devices.

2.05 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or III.

1. For surfaces exposed to view in finished structure, use same type, brand, and mill source throughout the precast concrete production.

B. Supplementary Cementitious Materials

1. Fly Ash: ASTM C 618, Class C or F with maximum loss on ignition of 3%.

C. Normal-weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse, non-reactive aggregates complying with Class 4M. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or liquid coloring admixtures, temperature stable and nonfading. Color:

1. Panels specified with thin brick = match Argos Magnolia Ultra Dark
2. Panels specified as light sand blast finish = match Argos Magnolia Mason’s Mix

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

F. Air Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. Water-Reducing and Accelerating Admixture ASTM C494, Type E.
5. High Range, Water-Reducing Admixture: ASTM C 494, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
7. Plasticizing Admixture for Flowable Concrete: ASTM C 1017.
8. Corrosion Inhibiting Admixture: ASTM C 1582

2.06 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36

B. Carbon-Steel Headed Studs: ASTM A 108, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with the minimum mechanical properties of PCI MNL 116, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283, Grade C.

D. Malleable Iron Castings: ASTM A 47. Grade 32510 or 35028.

E. Carbon-Steel Castings: ASTM A 27, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A. carbon-steel, hex-head bolts and studs; carbon-steel nuts (ASTM A 563, Grade A); and flat, unhardened steel washers (ASTM F 844).

K. High-Strength Bolts and Nuts: ASTM A193, Grade B5 or B7, ASTM A 325, or ASTM A 490, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, (ASTM A 563) and hardened carbon-steel washers (ASTM F 436).

L. Shop-Primed Finish shall not be permitted. Refer to Zinc-Coated Finish below.

M. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123, after fabrication, ASTM A 153, or ASTM F 2329 as applicable or electrodeposition according to ASTM B 633, SC 3, Type 1 or 2 and for bolts F 1941.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon content and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight and complying with DOD-P-21035B or SSPC-Paint 20.

N. Galvanizing Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight and complying with DOD-P-21035B or SSPC-Paint 20. Comply with manufacturer’s requirements for surface preparation.

2.07 BEARING PADS AND OTHER ACCESSORIES

A. Provide one of the following bearing pads for structural precast concrete members as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D 2240, minimum tensile strength 2250 psi per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pad.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D 2240. Conforming to Division II, Section 18.10.2 of AASHTO LRFD Bridge Design Specifications or Military Specification, MIL-C-882E.
4. Frictionless Pads: Polytetrafluoroethylene (PTFE), glass-fiber reinforced, bonded to stainless or mild-steel plates, or random-oriented, fiber-reinforced elastomeric pads, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip capable of supporting loads with no visible overall expansion.

B. Reglets: Reglets and flashing are specified in Section 07620 “Sheet Metal Flashing and Trim.” felt or fiber filled face opening of slots covered.

C. Erection Accessories: Provide clips, hangers, high density plastic or steel shims, and other accessories required to install structural precast concrete members.

D. Welding Electrodes: Comply with AWS standards for steel type and/or alloy being welded.

2.08 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144, or ASTM C 404. Mix at ratio of 1 part cement to 2 ½ to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content of grout less than 0.06 percent chloride ion by weight of cement when tested in accordance with ASTM C 1218/C 1218M.

B. Nonshrink Grout: Premixed, prepackaged ferrous and non-ferrous aggregate shrink-resistant grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application with a 30-minute working time. Water-soluable chloride ion content of grout less than 0.06 percent chloride ion by weight of cement when tested in accordance with ATM C1218/C1218M.

C. Epoxy-Resin Grout: Two-component mineral-filled epoxy-resin: ASTM C 881 of type, grade, and class to suit requirements.

2.09 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Limit use of fly ash to 35 percent replacement of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at structural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested in accordance with ASTM C 1218.

D. Normalweight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normalweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Release Strength: as required by design, 3500 psi minimum.
3. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

F. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

G. Concrete Mixture Adjustments: Concrete mixture design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.10 FORM FABRICATION

A. Form: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placement and vibration operations and temperature changes, and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain forms to provide completed structural precast concrete members of shapes, lines, and dimensions indicated in Contract Documents, within fabrication tolerances specified.

1. Edge and Corner Treatment: Uniformly chamfered or as built-in on standard forms.

2.11 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in members unless approved by Architect.

1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, hangers, and other hardware shapes for securing precast concrete members to supporting and adjacent construction.

C. Cast-in reglets, slots, and other accessories in structural precast concrete members as indicated on Contract Drawings.

D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Engineer's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy coated reinforcing exceeds limits specified in ASTM A 775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Locate and support reinforcement by plastic tipped or corrosion resistant metal or plastic chairs, runners, bolsters, spacers, hangers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.
3. Place reinforcing steel and prestressing tendons to maintain at least ¾ in. minimum concrete cover. Provide cover requirements in accordance with ACI 318 when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces in accordance with ACI 318 and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce structural precast concrete members to resist handling, transportation, and erection stresses, and specified in-place loads, whichever governs.

G. Prestress tendons for structural precast concrete members by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast prestressed concrete members until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete member.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Recess strand ends and anchorages exposed to view a minimum of 1 inch, fill with non-metallic, non-shrink mortar and sack rub surface. Coat or spray the inside pocket surfaces with a bonding agent before installing mortar.
5. Protect strand ends and anchorage not exposed to view with bitumastic, zinc-rich or epoxy paint.

H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete members.

1. Place backup concrete to ensure bond with face-mixture concrete.

J. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration in accordance with PCI TR-6 “Interim Guidelines for the Use of Self-Consolidating Concrete.” If face and backup concrete is used, ensure adequate bond between concrete mixtures.

K. Comply with PCI MNL 116 procedures for hot and cold-weather concrete placement.

L. Identify pickup points of precast concrete members and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete member on a surface that will not show in finished structure.

M. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure members until compressive strength is high enough to ensure that stripping does not have an effect on the performance or appearance of final product.

2.12 FABRICATION TOLERANCES

A. Fabricate structural precast concrete members of shapes, lines and dimensions indicated, so each finished member complies with PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

B. Thin Brick Dimensional Tolerances – measure in accordance with ASTM C67

1.	Thickness:	Plus 0 in., minus 1/16 in.
2.	Face Size:	Plus 0 in., minus 1/16 in. for dimensions 8 in. or less Plus 0 in., minus 3/32 in. for dimensions greater than 8 in.
3.	Warpage:	Not more than 1/16 in. either concave or convex froma consistent plane
4.	Out of Square:	Plus or minus 1/16 in.
5.	Shape Angle:	Plus or minus 1 degree from specified angle

2.13 FINISHES

A. Commercial (Structural) Finishes. The following finish shall be acceptable for all Interior precast concrete members including but not limited to shear walls, metro walls, double tees, wall panels, T-beams and spandrels.

1. Standard Grade: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch (13mm) caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are acceptable. Fill air holes greater than 1/4 inch (6 mm) in width that occur in high concentration (more than one per 2 in.^{2} [1300 mm^2]). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Allowable joint offset limited to 1/8 inch (3 mm).

B. Architectural Finishes. The following finish shall be acceptable for all Exterior precast concrete members including but not limited to walls columns, spandrels and insert panels exposed to exterior.

1. Grade B Finish: Fill air pockets and holes larger than 1/4 inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch (3 mm) in width that occur in high concentration (more than one per 2 in.^{2} [1300 mm^2]). Grind smooth form

offsets or fins larger than 1/8 inch (3 mm). Repair surface blemishes due to dents in forms. Discoloration is permitted at form joints.

2. Abrasive Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces to match accepted sample or mockup units. Apply light sand blast finish.
3. Thin Brick Units:
   a. Face Size: Modular, 2 1/4 in. high by 7 5/8 in. long.
   b. Thickness: Not less than ½" nor more than 1".
   b. Face Size, Color and Texture: Basis of Design: Saturn Materials, LLC. Modular Brick – Charcoal. Phone: 662-798-4797, Website: www.saturnmaterials.com
   c. Special Shapes: Include corners, edge corners, and end edge corners.
   e. Breaking strength: Not less than 250 psi (1.7 MPa) tested in accordance with ASTM C67
   f. Cold water absorption: Maximum 6% at 24 hours tested in accordance with ASTM C67
   g. Efflorescence: Rated "not effloresced" when tested in accordance with ASTM C67
   h. Freeze thaw resistance:
      1) Uncoated brick: No detectable deterioration (spalling, cracking, or breaking) after 300 cycles tested in accordance with ASTM C666, Method A or B on assembled specimens
      2) Surface coloring: No observable difference in the applied finish when viewed at a distance of 20 ft (6m) after 50 cycles tested in accordance with ASTM C67. In addition, the brick shall undergo ASTM C666 test described above.
   i. Pull-out strength: Not less than 150 psi (1.0 MPa) from base concrete before and after freeze thaw testing tested in accordance with specified modification to ASTM E488.
   j. Chemical resistance: Rated "not affected" when tested with a 10% hydrochloric acid solution in accordance with ASTM C650.

4. Thin Brick Facings:
   a. Place form liner templates accurately to provide grid for brick facings. Provide solid backing and supports to maintain stability of liners while placing bricks and during concrete placement.
   b. Match appearance of sample units.
   c. Securely place brick units face down into form liner pockets and place concrete backing mixture.
   d. After stripping units, clean faces and joints of brick facing.

5. Brick-Faced Architectural Precast Concrete Units:
   a. Alignment of mortar joints:
      1) Jog in Alignment: 1/8 in.
      2) Alignment with Panel Centerline: Plus or Minus 1/8 in.
   b. Variation in Width of Exposed Mortar Joints: Plus or Minus 1/8 in.
   c. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 0 in.; Minus 1/4 in. ≤ depth of form liner joint.
   d. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 1/4 in.; Minus 1/8 in.
   e. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 0 in; Minus 1/4 in. ≤ depth of form liner joint.

2.14 SOURCE QUALITY CONTROL

A. Precast Concrete

1. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements. If using self-consolidating concrete also test and inspect according to PCI TR-6

"Interim Guidelines for the Use of Self-Consolidating Concrete" and ASTM C 1611, ASTM C 1712, ASTM 1610, and ASTM C 1621.

2. In addition to PCI Certification, Owner will employ an accredited independent testing agency to evaluate structural precast concrete fabricator's quality-control and testing methods.
   a. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

3. Strength of precast concrete members will be considered deficient if units fail to comply with ACI 318 concrete strength requirements.
4. Testing: If there is evidence that strength of precast concrete members may be deficient or may not comply with ACI 318 requirements, fabricator shall employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42and ACI 318.
   a. A minimum of three (3) representative cores shall be taken from members of suspect strength, from locations directed by Architect.
   b. Cores shall be tested in an air-dry condition or if members will be wet under service conditions, test cores, after immersion in water, in a wet condition.
   c. Strength of concrete for each series of three cores will be considered satisfactory if the average compressive strength and no single core is less than 75 percent or the 28-day design compressive strength.
   d. Test results shall be reported in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports shall include the following:
      1) Project identification name and number.
      2) Date when tests were performed.
      3) Name of precast concrete fabricator.
      4) Name of concrete testing agency.
      5) Identification letter, name, and type of precast concrete member(s) represented by core tests; design compressive strength; type of failure; actual compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

5. Patching: If core test results are satisfactory and precast concrete members comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
6. Defective Work: Structural precast concrete members that do not comply with acceptability requirements in PCI MNL 116, including concrete strength, and manufacturing tolerances, color and texture range are unacceptable. Chipped, spalled or cracked members may be repaired.
   a. Replace unacceptable units with precast concrete members that comply with requirements.
   b. The Architect reserves the right to reject any member if it does not match the approved samples.

B. Thin Brick

1. Minimum number of test specimens: In accordance with appropriate ASTM specifications except as specified in D.1.a.
   a. Exception for freeze thaw and pull-out strength tests: Ten (10) assembled specimens measuring 8 in. by 16 in. long with the brick embedded into the concrete substrate (assembled specimens). The ten (10) assembled specimens are divided into five (5) Sample A assemblies and five (5) Sample B assemblies. The precast concrete substrate shall have a minimum thickness of 2-1/2 in. plus the embedded brick thickness. The precast concrete shall have a minimum compressive strength of at least 5000 psi and 4 to 6% entrained air. The embedded brick coursing pattern for testing purposes shall be modular size brick on a

half running bond pattern with a formed raked joint geometry of no less than 3/8 in. wide and a depth no greater than 1/4 in. from the exterior face of the brick.

One brick from the center of each sample assembly shall be tested for pull- out strength. Each Sample B assembly shall first be tested for freeze thaw resistance. In place of anchor specified in ASTM E488, use 3/8 in. minimum thickness steel plate of same size as single brick face bonded with epoxy to a single brick face for each pull-out strength test. The steel plate shall have a centrally located pull-rod welded to the plate.

2. Back surface texture of samples for pull-out strength and freeze thaw resistance testing shall be the same.
3. Frequency of testing:
   a. Dimensional tolerances shall be checked prior to shipping on each run of brick supplied to the project.
   b. Cold water 24-hour absorption testing shall be conducted on every clay body/color of project specific brick prior to each shipment. Submit written documentation. The buyer reserves the right to conduct the same test prior to first shipment.
   c. All other tests specified shall be conducted for each clay body at an accredited laboratory at least every six (6) years.

2.15 INSULATED PANEL ACESSORIES

A. Acceptable Types of Insulation to Achieve R-:

1. Expanded-Polystyrene Board Insulation: ASTM C578

B. Wythe Connectors:

1. Provide holes in insulation for connector placement at least 4 in. and no more than 12 in. from edges of panels or openings.

2.16 INSULATION PANEL CASTING

A. Cast, screed, and consolidate bottom concrete wythe supported by mold

B. Place insulation board, abutting edges and ends of adjacent boards. Insert wythe connectors through insulation holes and consolidate concrete around connectors according to connector manufacturer’s written instructions.

C. Ensure bottom wythe or insulation layer are not disturbed after bottom wythe reaches initial set.

D. Cast and screed top wythe to meet required finish.

E. Maintain temperature below 150 deg. F (65 deg. C) in bottom concrete wythe.

PART 3 – EXECUTION

3.01 PREPARATION

A. Furnish loose connection hardware and anchorage devices for precast concrete members to be embedded in or attached to the building structural frame or foundation before starting that Work. Provide locations, setting diagrams, templates, and instructions for the proper installation of each anchorage device.

3.02 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting precast concrete performance.

B. Proceed with precast concrete installation only after unsatisfactory conditions have been corrected.

C. Contractor shall notify precast concrete erector that supporting cast-in-place concrete foundation and building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is structurally ready to receive loads from precast concrete members prior to proceeding with installation.

3.03 ERECTION

A. Install loose clips, hangers, bearing pads, and other accessories required for connecting structural precast concrete members to supporting members and backup materials.

B. Erect structural precast concrete level, plumb and square within the specified allowable erection tolerances. Provide temporary structural framing, shoring and bracing as required to maintain position, stability, and alignment of members until permanent connections are completed.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete members are being erected. Surface weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use plastic patchcaps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
4. Unless otherwise indicated provide uniform joint widths of ¾ in.

C. Connect structural precast concrete members in position by bolting, welding, grouting, or as otherwise indicated on approved Shop (Erection) Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and/or grouting are completed.

1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.

D. Welding: Comply with applicable AWS D1.1, AWS D1.4 and AWS D1.6 requirements for welding, welding electrodes, appearance of welds, quality of welds, and methods used in correcting welding work.

1. Protect structural precast concrete members and bearing pads from damage during field welding or cutting operations and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS D1.1, D1.4 or D1.6.
3. Clean-weld-affected metal surfaces with chipping hammer followed by brushing or power tool cleaning and then reprime damaged painted surfaces in accordance with manufacturer’s recommendations.
4. For galvanized metal, clean weld affected metal surfaces with chipping hammer followed by brushing or power tool cleaning and apply a minimum 0.004 inch thick coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A 780.
5. Visually inspect all welds critical to precast concrete connections. Visually check all welds for completion and remove, reweld or repair all defective welds, if services of AWS-certified welding inspector are not furnished by Owner.

E. At bolted connections, use upset threads, thread locking compound or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness at installation. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip critical connections, one of the following methods shall be used to assure proper bolt pretension:
   a. Turn-of-Nut – in accordance with AISC.
   b. Calibrated Wrench – in accordance with AISC.
   c. Twist-off Tension Control Bolt – meeting ASTM F 1852.
   d. Direct-Tension Control Bolt – meeting ASTM F 1852.
3. For slip critical connections, the method to be used and the inspection procedure to be used shall be approved by the Architect and coordinated with the inspection agency.

F. Grouting or Dry-Packing Connections and Joints: Indicate joints to be grouted and any critical grouting sequences on Shop (Erection) Drawings. Grout open spaces at keyways, connections and joints where required or indicated. Provide reinforcing steel where indicated. Retain flowable grout in place until it gains sufficient strength to support itself. Fill joints completely without seepage to other surfaces. Alternatively, pack spaces with stiff dry pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for at least 24 hours after initial set.

1. Trowel top of grout joints on roofs smooth to prevent any unevenness that might interfere with placing of, or cause damage, to insulation and roofing. Finish transitions due to different surface levels not steeper than 1 to 12.

G. Field cutting of precast, prestressed concrete members is not permitted without approval of the Engineer.

H. Fasteners: Do not use drilled or power-actuated fasteners for attaching accessory items to precast, prestressed concrete members unless approved by Precast Engineer and Engineer of Record.

3.04 ERECTION TOLERANCES

A. Erect structural precast concrete members level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Level out variations between adjacent members by jacking, loading, or any other feasible method as recommended by the fabricator and acceptable to the Architect.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of loadbearing precast concrete members.

B. Testing: Owner will engage accredited independent testing and inspecting agency to perform field tests and inspections and prepare reports.

1. Field welds will be subject to visual inspections and dye penetrant or magnetic particle testing in accordance with ASTM E 165 or ASTM E 1444. Testing agency shall be qualified in accordance with ASTM E543.
2. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Erector's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS

A. Repairs will be permitted provided structural adequacy, serviceability and durability of members and appearance are not impaired.

B. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

C. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

D. Remove and replace damaged structural precast concrete members when repairs do not comply with specified requirements.

3.07 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete members after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

C. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect adjacent work from staining or damage due to cleaning operations.

D. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 41 00

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

1.02 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges (2016)", that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.03 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details and procedures indicated in AISC's " Steel Construction Manual," Parts 9 through 15.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
3. Connections for a beam which cannot conform to AISC typical connection details shall be designed and detailed in accordance with the following.
    a. Where beam reactions are not shown on the drawings, connections shall be designed for one-half the maximum uniform load which the beam will support (as simple span) for the span shown on the drawings for non-composite beams or three-quarters of the maximum uniform load which the beam will support (as simple span) for the span shown on the drawings for composite beams.
    b. Where connections support beams which are subject to concentrated loads, such concentrated loads shall be taken into account when designing the connections.
    c. Where connections are subject to eccentricity, such eccentricity shall be taken into account when designing the connections.
    d. End connections of floor members shall accommodate end rotations of simple, unrestrained beams. For this purpose, inelastic action in the connection is permitted.
    e. Coped or cut ends of members shall be reinforced where required to sustain the specified reactions.

B. Design Responsibility: The Fabricator shall be responsible for all errors of detailing on the shop drawings, errors in fabrication, and for the correct fitting of the structural steel members.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Shop primers.
4. Nonshrink grout.

E. Source quality-control test reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer with not less than 5 years' experience in the erection of structural steel who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance, and who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges (AISC 303-16)".
   a. Paragraph 4.4.1 (b) of the above Code is hereby modified by the revision: "Confirmation that the Owner's Designated Representative for Design has reviewed the Connection details shown on the Shop and Erection Drawings and submitted in accordance with Section 3.1.2, if applicable; and,"
   b. Paragraph 4.4 of the above is hereby modified by the revision: "The shop and erection drawings shall be returned to the Fabricator within 23 calendar days."

2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's Specification for Structural Steel Buildings—AISC 15th edition (2016).
4. AISC's "Specification for Structural Joints Using High-Strength Bolts (2014)."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.07 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992.

B. Channels, Angles, M, S-Shapes: ASTM A 36.

C. Plate and Bar: ASTM A 36.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain
2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
   a. Finish: Plain

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type, plain.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Anchor Rods: ASTM F 1554, Grade 55, straight.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436 hardened carbon steel.
4. Finish: Plain.

F. Threaded Rods: ASTM A 36

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436 hardened ASTM A 36 carbon steel.
3. Finish: Plain

G. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

2.03 PRIMER:

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.04 GROUT:

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's Specification for Structural Steel Buildings—AISC 15th edition (2016).

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

2.06 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless otherwise indicated on the drawings or where pretensioned or slip-critical joints are recommended or required by RCSC or AISC.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. For architecturally exposed structural steel, remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
    a. Grind butt welds flush.
    b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.07 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.08 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify elevations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

F. No burning or welding of steel shall be performed unless shown on the drawings and specifications or directed by the Structural Engineer of Record. Any burning performed to elongate hole openings or to otherwise facilitate erection shall not be permitted and all affected steel members shall be removed and replaced.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless otherwise indicated on the drawings or where pretensioned or slip-critical joints are recommended or required by RCSC or AISC.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings—AISC 15th edition (2016) for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
   a. Grind butt welds flush.
   b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
3. Contractor shall clean and prime all joints and bolts within 72 hours of installation.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures if the quality of project welds cannot be confirmed by visual inspection alone. Testing procedure shall be the option of the testing agency.
   a. Liquid Penetrant Inspection: ASTM E 165
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

E. Contractor shall not request engineer approval or acceptance of any determined deficiency with the Contract Documents.

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.

3.06 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05 12 00

SECTION 05 31 00

STEEL DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Composite roof deck

1.02 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates.

D. Welding certificates.

E. Field quality-control test and inspection reports.

1.03 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Canam Steel Corp.; The Canam Manac Group.
2. Consolidated Systems, Inc.
3. Nucor Corp.; Vulcraft Division.
4. Roof Deck, Inc.
5. United Steel Deck, Inc.
6. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.02 COMPOSITE ROOF DECK

A. Composite Steel Roof Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Roof Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653 Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more, whenever possible. Single span permitted at stair landings.

2.03 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Rolled-in Hanger Tabs: Provide for use with roof deck as indicated on plans.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section, and as indicated on the structural contract documents.

B. Locate deck bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.02 ROOF-DECK INSTALLATION

A. Fasten roofr-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Roof-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Roof trusses.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated**.**
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
   b. Roof Trusses: Vertical deflection of 1/240 of the span under total roof load.
3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch, or primary building framing element span divided by 240 (whichever is greater).

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.03 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data

E. Product Test Reports

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record successful in service performance.

B. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Clark Steel Framing

2. Craco Metals Manufacturing, LLC.
3. Custom Stud, Inc.
4. Dale/Incor.
5. Design Shapes in Steel.
6. Dietrich Metal Framing, a Worthington Industries Company.
7. MarinoWare; a division of Ware Industries
8. United Metal Products, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance
2. Coating: G90 or equivalent

2.03 EXTERIOR LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch
2. Flange Width: 1-5/8 inches

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch
2. Section Properties: As indicated on drawings.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Minimum Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Minimum Flange Width: 1 inch plus the design gap for 1-story structures.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.05 ROOF TRUSSES

A. Roof Truss Members: Manufacturer’s standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges.

1. Minimum Base-Metal Thickness of truss top chord: 0.0538 inch.
2. Minimum Base-Metal Thickness of other than Top Chord: 0.0329 inch, unless noted otherwise on structural drawings.
3. Flange Width: 1-5/8 inches, minimum.

2.06 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.07 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Rods: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.08 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.09 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 EXTERIOR LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As indicated on drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Anchor studs abutting structural columns to supporting structure as indicated.

F. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced as indicated on drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.

I. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to infill studs and anchor to building structure.
3. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   a. Install solid blocking at 96-inch centers maximum.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.06 TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.

B. Truss Spacing: As indicated.

C. Do not alter, cut, or remove framing members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging framing members or connections.

F. Align webs of bottom chords and load-bearing studs or continuously reinforce tack to transfer loads to structure. Anchor trusses securely at all bearing points.

G. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."

3.07 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following metal fabrications:

1. Rough hardware.
2. Ladders.
3. Miscellaneous framing and supports for the following:
   a. Overhead doors.
   b. Applications where framing and supports are not specified in other sections.
4. Miscellaneous steel trim, including the following:
   a. Steel angle corner guards.
   b. Edgings.
5. Pipe bollards.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 01 33 00 Submittals.

B. Product data for nonslip aggregates and nonslip aggregate surface finishes, prefabricated building columns, steel floor plate, paint products, and grout.

C. Shop Drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Samples representative of materials and finished products as may be requested by Design professional.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of design professionals and Owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of five (5) years minimum, successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 – PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36M).

C. Rolled Steel Floor Plates: ASTM A 786 (ASTM A 786M).

D. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.
2. Hot-Formed Steel Tubing: ASTM A 501.
   a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

E. Steel Pipe: ASTM A 53, refer to Drawings for weight, width and height.

1. Primer finish, unless otherwise indicated.
2. Galvanized finish for exterior installations and where indicated.

F. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

G. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor

of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27 (ASTM A 27M) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.04 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrode-posited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.05 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Nonshrink, Metallic Grouts:
   a. Supreme Plus; Cormix Construction Chemicals.
   b. Hi Mod Grout; Euclid Chemical Co.
   c. Embeco 885 and 636; Master Builders Technologies, Inc.
   d. Ferrolith G Redi-Mix and G-NC; Sonneborn Building Products--ChemRex, Inc.
   e. Met-ox; The Spray-Cure Company.
2. Nonshrink, Nonmetallic Grouts:
   a. B-6 Construction Grout; W. R. Bonsal Co.
   b. Diamond-Crete Grout; Concrete Service Materials Co.
   c. Supreme; Cormix Construction Chemicals.
   d. Sure-grip High Performance Grout; Dayton Superior Corp.
   e. Euco N-S Grout; Euclid Chemical Co.
   f. Five Star Grout; Five Star Products.
   g. Vibropruf #11; Lambert Corp.
   h. Crystex; L & M Construction Chemicals, Inc.
   i. Masterflow 928 and 713; Master Builders Technologies, Inc.
   j. Sealtight 588 Grout; W. R. Meadows, Inc.
   k. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
   l. Kemset; The Spray-Cure Company.

2.06 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.07 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop Drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C) ambient 180 deg F (100 deg C) material surfaces.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.08 ROUGH HARDWARE

A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.13 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
   a. Except as otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

C. Fabricate support for suspended toilet partitions as follows:

1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers, but use not less than C8 by 11.5 (C200 by 17.1) channels or another shape with equivalent structural properties.
2. Hangers: Steel rods, 1/2-inch (13-mm) minimum diameter, spaced not more than 36 inches (900 mm) o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.
3. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.

D. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.14 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.15 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 – EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting Drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.03 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, metallic grout in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

B. Fill bollards solidly with concrete, mounding top surface.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Wood blocking, cants, and nailers.
2. Wood furring.
3. Sheathing.
4. Plywood backing panels.

B. Related Sections include the following:

1. Division 6 Section “Interior Architectural Woodwork” for nonstructural carpentry items exposed to view and not specified in another Section.

1.03 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA – Northeastern Lumber Manufacturers Association.
2. NLGA – National Lumber Grades Authority.
3. RIS – Redwood Inspection Service.
4. SPIB – Southern Pine Inspection Bureau.
5. WCLIB – West Coast Lumber Inspection Bureau.
6. WWPA – Western Wood Products Association.

1.04 SUBMITTALS

A. Products Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer’s written instructions for handling, storing, installing, and finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research / Evaluation Reports: For the following, showing compliance with International Building Code, 2012 edition:

1. Preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Laminated-Veneer Lumber (LVL):

a. Boise Cascade

2. Metal Framing Anchors:

a. Simpson Strong-Tie Company, Inc.

2.02 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to review a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sized are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Wood Structural Panels:

1. Plywood: Fire Retardant Treated Exterior Grade
2. Thickness: 5/8”
3. Factory mark panels according to indicated standard.

2.03 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:

a. Chromated copper arsenate (CCA).
b. Ammoniacal copper zinc arsenate (ACZA).
c. Ammoniacal, or amine, copper quat (ACQ).
d. Copper bis (dimethyldithiocarbamate)(CDDC).
e. Ammoniacal copper citrate (CC).
f. Copper azole, Type A (CBA-A).
g. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.
4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.04 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Joists, Rafters, and Other Framing: Pursuant to structural drawings.

C. Exposed Exterior Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics that would impair finish appearance.

1. Species and Grade: As indicated above for load bearing construction of same type.

2.05 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Rooftop equipment bases and support curbs.
2. Blocking.
3. Cants.
4. Nailers.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide No. 2 grade lumber with 19 percent maximum moisture content and the following species:

1. Southern Yellow Pine (SYP) or Spruce-Pine-Fir (SPF)

C. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.06 SHEATHING

A. Plywood Wall Sheathing:

1. Span Rating: Not less than 24/0.
2. Thickness: Not less than ½ inch.

B. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 79, with water-resistant material incorporated into the core and with water–repellent paper bonded to core’s face, back, and long edges.

1. Type and Thickness: Regular, ½ inch, Type X, 5/8 inch thick.
2. Edge and End Configuration: square ends.
3. Size: 48 by 96 inches for vertical or 48 by 108 inches for vertical installation.

C. Plywood Roof Sheathing: Exterior Exposure 1, sheathing.

1. Span Rating: Not less than 32/16
2. Thickness: 5/8”

2.07 FASTENERS

A. General: Provide fasteners of size and type of indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.

2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.
6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrilled as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.02 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screening or attaching other work. Form to shapes indicated and cut as require for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations contained APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below

1. Sheathing:

a. Nail or staple to wood framing.
b. Space panels 1/8 inch apart at edges and ends.

2. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 06 10 00

SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Plastic-laminate cabinets.
   2. Wood veneer wall panel system.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, shims, and hanging strips for installing interior woodwork.

1.03 DEFINITIONS

Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each type of product indicated, including cabinet hardware and accessories.

C. Shop Drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Plastic laminates.
   2. Wood veneer wall panel.

E. Samples for verification of the following:
   1. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
   2. Edge profiles for plastic-laminate materials.
   3. Exposed cabinet hardware and accessories, one unit for each type and finish.
   4. Phenolic wood veneer-clad products, 5 by 7 inches, for each type, color, pattern, and surface finish required.
   5. Metal trim sample for wall panel system.

F. Product certificates signed by woodwork fabricators certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in "Quality Assurance", Article 1.5 below to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.02 QUALITY ASSURANCE

A. Cabinet Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork cabinetry specified in this Section.

C. Wall Panel System Qualifications: Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
1. ASTM E 84 (Method for test for surface burning characteristics of building Materials).
2. Required Rating – Class C

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified below in Article 1.07 "Project Conditions".

C. Deliver wall panels and associated materials factory packaged on strong pallets and properly packaged or protected.
1. Upon delivery carefully inspect all cartons, packages, pallets and protective wrap for damage or material shortage.
2. Open and inspect suspect packages, cartons or wrapped pallets for damage.
3. Contact shipper immediately to report any damaged or missing materials.
4. Contact AAM immediately to report any damaged or missing.
5. Do commence installation if any components are missing or damaged.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Additional Environmental Limitations: Do not deliver or install woodwork until HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

C. Field Measurements: Check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop Drawings.

D. Partition walls are to be finished and the building completely closed. Walls shall be thoroughly dry and concrete cured and dry before installation. HVAC system must be operable and installation area must be balanced to normal operation conditions before installation.

E. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. To ensure product performance, a temperature range of 60°-80°F (16°C-27°C) and a humidity range of 35-55% must be maintained during storage, installation and product life cycle. Do not install products under environmental conditions outside manufacturer's absolute limits. Us environmental guidelines specified by AWI.

1.05 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Wall Panels: Except as specified by the architect, it's recommended to locate trim members so that panel lines coordinate with doors, headers, jambs and other discontinuities in a wall. Vapor barrier shall be used on exterior walls behind backing to discourage warping. Coordinate with casework manufacturer. Deliver material to the fabrication shop.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General Cabinetry: Provide materials where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
   1. Cabinet Core Materials in Low Humidity Areas: All core material shall be cabinet grade hardwood plywood with MDF doors as follows:
      a. 1/4" Nominal thickness maple hardwood plywood with MDF core (Grade A-4).
      b. 1/2" Nominal thickness maple hardwood plywood with 5 ply veneer core (Grade A-1)
      c. 3/4" Nominal thickness maple hardwood plywood with 7 ply veneer core (Grade A-1)
   2. Cabinet Core Materials in the Kitchen and Restrooms: All core material shall be marine grade plywood with MDF doors as follows:
      a. 1/4" Nominal thickness marine grade plywood with MDF core (Grade A-4).
      b. 1/2" Nominal thickness marine grade plywood with 5 ply veneer core (Grade A-1)
      c. 3/4" Nominal thickness marine grade plywood with 7 ply veneer core (Grade A-1)
   3. Toe Kick Materials: All toe kicks shall be constructed of pressure treated lumber as follows:
      a. 3/4" nominal thickness pressure treated plywood
      b. 2"x4" nominal thickness pressure treated lumber

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Wilsonart International, Inc. (Basis of Design)
b. Nevamar
c. Pionite
d. Architect approved equal.

2. Colors and Patterns: Color shall be selected from manufacturer's full range of colors by Architect. Refer to Drawings for color selections, locations and patterns.

C. Wood Panel: Panel configuration with wood fiber substrate and phenolic panels.
1. Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. National Wood Solutions / National Solutions (Basis of Design) www.nationalsolutions.com
b. Architect approved equal.
2. Colors and Patterns: Color to match plastic laminate as indicated on drawings. Refer to Drawings for color selections, locations and patterns.

D. Wood Panel System Hardware: Horizontal Cross Rail framing and panel fixings as recommended by manufacturer.
1. Horizontal Cross Rail Framing.
a. H-HR10A – Horizontal Rail, to create detailed reveals. Furnished in full 10'-0" (3.05m) lengths.
b. H-PC-1 – Panel Clib, on which panels will be recorded.
c. H-RT – Reveal Tape
2. Panel Fixings.
a. H-FS-1 – Panel Secure Fasteners.

2.02 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 "Finish Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
1. Satin Stainless Steel: BHMA 630.

E. Plastic Grommets: Provide 2" black grommets for field location by the Owner and installation by the Contractor at Substantial Completion.

2.03 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements:

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.04 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch thick or less: 1/16 inch.
2. Edges of rails and similar members more than 3/4 inch thick: 1/8 inch.

D. Complete fabrication, including assembly, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.05 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
1. Horizontal Surfaces Other Than Tops: HGS.
2. Postformed Surfaces: HGP.
3. Vertical Surfaces: HGS.
4. Edges: edge banding shall match adjacent cabinet panel color.
5. Doors: 3mm PVC edge banding attached by 3mm hot melt glue applied edge banding machine.
6. Drawers: 3mm PVC edge banding attached by 3mm hot melt glue applied edge banding machine.
7. Cabinets: 1mm PVC edge banding

C. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: As indicated on Drawings
2. Drawer Sides and Backs: As indicated on Drawings
3. Drawer Bottoms: As indicated on Drawings

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Colors shall be selected from manufacturer's full range of colors and finishes by Architect. Refer to Drawings for locations and patterns.

2.06 WOOD WALL PANEL SYSTEM

A. All framing, panels, hardware and accessories shall be factory finished and ready to install except for field fabrication as required by jobsite and perimeter conditions.
1. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.
2. For all cut-outs, drill corners for a minimum 1/8" radius.

PART 3 – EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

C. Wall Panel System: Installer examine conditions under which construction activities of this section are to be performed. Submit written notification to Architect and system manufacturer if such conditions are unacceptable. Beginning erection constitutes installer's acceptance of conditions.
1. Verify that a vapor barrier has been provided on exterior walls behind backing to prevent warping.
2. Verify backing panels are smooth, solid, and flat. All drywall joints are to be taped and finished.
3. Verify that walls are primed before installation begins.
4. Verify mechanical, electrical, and building service and/or items affecting work of this section are placed and ready to receive this work.
5. Verify that sufficient blocking is provided.
6. Structural walls are to be finished, with building completely closed. Walls shall be thoroughly dry before starting installation.

3.02 INSTALLATION

A. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

B. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as

required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

D. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

E. Wall Panel System: Install all materials in strict accordance with the manufacturer's installation instructions with hardware straight, plumb, and level.
   1. Anchor units rigidly and securely in place.
   2. Cut sheets to meet existing supports.
   3. Fasten vertical and horizontal trim using #6 trim-head screws anchored into a stud or other solid substrate at 16" (40.64cm) centers.
   4. Avoid contamination of the panel faces with adhesives, solvents or cleaners during installation

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Contractor that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.05 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. Manufacturers and BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Butt Hinges:
   1. Concealed Hinges for Overlay Doors: BHMA A156.9- 1994 Grade 1 criteria.
   2. Half overlay, 110º, soft close.

C. Wire Pulls: As indicated on drawings. Back mounted.

D. Shelf Rests: BHMA A156.9, B04013.

E. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, Grade 1 and rated for the following loads:
   1. Box Drawer Slides: 100 lbf
   2. File Drawer Slides: 200 lbf
   3. Keyboard Slide: 100 lbf

F. Door Locks: BHMA A156.11, E07121. Locks keyed as indicated on Interior Drawings.

G. Drawer Locks: BHMA A156.11, E07041. Locks keyed as indicated on Interior Drawings.

H. Grommets for cable passage through countertops: Refer to Drawings for locations and type.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

END OF SECTION 06 40 23

SECTION 07 15 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
   a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   b. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   c. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
   d. B32, Standard Specification for Solder Metal.
   e. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   f. B370, Standard Specification for Copper Sheet and Strip for Building Construction.
   g. D1187, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
   h. D4586, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
2. Federal Specifications (FS): QQ-L-201F(2), Lead Sheet.
3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, 5th Edition.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections: Section(s) related to this section include:

1. Division 7 “TPO Roofing”.
2. Division 7 “Joint Sealants”.

1.3 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Metal flashing an Trim
2. Reglets.
3. Conductor heads and Downspouts

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces or
2. 12-inch- (300-mm-) long Samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Galvanized Steel Sheet: ASTM A 526, G 90 (ASTM A 526M, Z 275), commercial quality, or ASTM A 527, G 90 (ASTM A 527M, Z 275), lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch (1.0 mm) thick, unless otherwise indicated.

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

D. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

E. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: 24 ga. galvanized steel.

F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. For Concrete:
   a. Fry Reglet Corporation; Fry Springlok Type CO and Springlok Flashing.
   b. Cheney Flashing Co.; Type A reglet and Snap Lock Cap Flashing.
   c. Architect approved equal prior to bid.
2. For Masonry:
   a. Fry Reglet Corp.; Fry Springlok Type MA and Springlok Flashing.
   b. Cheney Flashing Co.; Type B and Snap Lock Cap Flashing.
   c. Architect approved equal prior to bid.
3. Surface Mounted:
   a. Fry Reglet Corp.; Fry Springlok Type SM and Springlok Flashing.
   b. Cheney Flashing Co.; Type D and Snap Lock Cap Flashing.
   c. Architect approved equal prior to bid.

G. Conductor Heads, Gutters and Downspouts:

1. Manufacturer:
   a. Petersen Aluminum Corporation, Acworth, GA 800-272-4482 (Basis of Design)
   b. Or Architect approved equal prior to Bid**.**
2. Quality Assurance:
   a. Conform to SMACNA Manual for nominal sizing of components for rainfall intensity determined by a storm occurrence of 1 in 100 years.
3. Delivery, Storage and Handling:
   a. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to aid ventilation. Slope to drain.
   b. Prevent contact with materials during storage which may cause discoloration, staining, or damage.
4. Products:
   a. Components:
      a) Conductor Heads: SMACNA ‘’FIG 1-25C’.
      b) Downspouts: SMACNA ‘Rectangular’.
      c) Downspout elbows.
      d) Anchorage Devices: SMACNA Requirements for bracket supports.
   b. Finish:
      a) PAC-CLAD finish color selected from Petersen Aluminum Corp. Standard Colors.
      b) Color: Dark Bronze
   c. Fabrication
      a) Form gutters and downspouts of profiles to SMACNA requirements.
      b) Field measure site conditions prior to fabricating work.
      c) Fabricate with required connection pieces.
      d) Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion of defects detrimental to appearance or performance. Allow for expansion at joints.
      e) Hem exposed edges of metal.
      f) Seal metal joints to create a water-tight condition.
      g) Fabricate gutter and downspout accessories; seal watertight.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

E. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints, and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

F. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal, and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

G. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

H. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

J. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 40 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Exposed Trim, Gravel Stops, and Fascia:

1. Factory Finished Steel: 24 ga. or as indicated on Drawings.

C. Base Flashing: Fabricate from the following material:

1. As indicated on Drawings.

D. Counterflashing: Fabricate from the following material:

1. Galvanized Steel: 24 ga. or as indicated on Drawings.

E. Drip Edges: Fabricate from the following material:

1. Galvanized Steel: 24 ga. or as indicated on Drawings.

F. Equipment Support Flashing: Roofing Manufacturer’s Standard Material (See Division 7)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as

indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Seams: Fabricate nonmoving seams in metal with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

D. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

E. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

F. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 15 00

SECTION 07 21 00

BUILDING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Formaldehyde-free concealed building insulation.
   2. Formaldehyde-free concealed sound control batts.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 9 Section "Gypsum Board Assemblies" for insulation installed as part of metal-framed soffit assemblies.

1.3 REFERENCES

A. ASTM International:
   1. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
   2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
   4. ASTM C665 Standard Specification for Mineral Fiber Blanket, Thermal Insulation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

C. Installation instructions.

D. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

E. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulations with International Building Code.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency

acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

C. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

D. Pre-installation Meeting
1. Refer to Section 01 31 20 Project Meetings, 1.07.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

C. Handle boards carefully so corners are not broken off or boards are otherwise damaged.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:
1. Johns-Manville (Basis of Design)
2. Owens Corning
3. Certainteed
4. Architect approved equal prior to bid

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Formaldehyde-Free™ Unfaced Faced Batts:
1. Thermal Resistance (R-Value) (ASTM C518):
   a. R-13 at infill around exterior wall structural framing
   b. R-22 at 8” wood framed exterior walls
   c. R-38 at roof area without rigid insulation
2. Combustion Characteristics (ASTM E136): Pass
3. Critical Radiant Flux (ASTM E970): Greater than 0.11 Btu/ft2 × s (0.12 W/cm2)
4. Water Vapor Permeance (ASTM E96): N/A

5. Water Vapor Sorption (ASTM C1104): 5% or less.
6. Odor Emission (ASTM C1304): Pass.
7. Corrosiveness (ASTM C665, 13.8): Pass.
8. Fungi Resistance (ASTM C1338): Pass.
9. Flamespread (ASTM E84): 25, maximum.
12. Smoke Developed (ASTM E84): 50, maximum.
13. Material Standard: ASTM C665, Type I

C. Formaldehyde-Free Sound Control Batts: Comply with requirements indicated below:
1. Product: Johns-Manville MinWool® Sound Attenuation Fire Batts
2. Thickness: 4”
a. Provide one (1) layer of 4” sound batt insulation over ceilings and in walls in locations indicated on Drawings. Refer to Interior Partition Notes.
3. Noncombustible per ASTM E136.
4. Flamespread (ASTM E84): 5 or less.
5. Smoke Developed (ASTM E84): 0 or less.
6. Material Standard (ASTM C665): Type I.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations, including removing all projections that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated.

3.4 INSTALLATION OF CAVITY WALL INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install glass-fiber blankets in cavities formed by framing members using blanket widths and lengths that fill the cavities formed by framing members.

3.6 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

B. Replace any insulation that is exposed to moisture or rain. Necessary precautions shall be taken to prevent water from reaching insulation.

END OF SECTION 07 21 00

SECTION 07 26 00

UNDERSLAB VAPOR RETARDER

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Vapor retarder, seam tape and mastic for installation under concrete slabs.

B. Application of an under-slab vapor retarder.

1.02 RELATED SECTIONS

A. Division 3 Section “Cast-In- Place Concrete”.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
2. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs.
3. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
4. ASTM E1643 – Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
5. ASTM F1249-01 – Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

B. American Concrete Institute (ACI):

1. ACI 302.2R-06 – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.04 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Submit manufacturer's product data, samples and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area in accordance with manufacturer's instructions.

C. Stack membrane on smooth ground or wood platform to eliminate warping.

D. Protect materials during handling and application to prevent damage or contamination.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not apply on frozen ground.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Stego Industries, LLC, 216 Avenida Fabricante, Suite 101, San Clemente, CA 92672. (877) 464-7834. Fax (949) 257-4113; Web Site www.stegoindustries.com. (Basis of Design)

B. W.R. Meadows, P.O. Box 338, Hampshire, IL 60140-2100. (800) 342-5976. Fax (864) 683-4544, Web Site www.wrmeadows.com.

C. Architect approved equal prior to bid. Refer to Section 016300 "Materials and Substitutions".

2.02 MATERIALS

A. Plastic Vapor Retarder:

1. Performance Based Specification: Vapor Retarder membrane must meet or exceed all requirements of ASTM E1745 Class A, B & C.
   a. Under Slab Vapor Retarders: ASTM E1745 Class A, B & C – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs: Exceeds Class A, B & C.
   b. Water Vapor Permeance: ASTM F1249 – Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor: 0.0086 perms.
   c. Puncture Resistance: ASTM D1709 – Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method: 2266 grams.
   d. Tensile Strength: ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting: 70.6 lbf/in.
   e. Permeance After Conditioning (ASTM E1745 Sections 7.1.2 – 7.1.5):
      - ASTM E154 Section 8, F1249 – Permeance after wetting, drying and soaking: 0.0098 perms.
      - ASTM E154 Section 11, F1249 – Permeance after heat conditioning: 0.0091 perms.
      - ASTM E154 Section 12, F1249 – Permeance after low temperature conditioning: 0.0097 perms.
      - ASTM E154 Section 13, F1249 – Permeance after soil organism exposure: 0.0095 perms.
   f. Thickness: ACI 302.1R-04 – Minimum Thickness: **Refer to 2.02.**

2. Products:
   a. Stego Wrap Class C Vapor Retarder 15 mils.
   b. Perminator 15 mil Vapor Barrier by W.R. Meadows.

2.03 ACCESSORIES

A. Seam Tape:

1. Use only manufacturer approved seam tape and mastic in accordance with manufacturer's installation requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive membrane. Ensure that base material is approved by Geotechnical Engineer. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturers instructions.

3.03 APPLICATION

A. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.

B. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.

C. Lap vapor barrier over footings and/or seal to foundation walls.

D. Overlap joints 6 inches and seal with manufacturer's tape.

E. Seal all penetrations (including pipes) per manufacturer's instructions.

F. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.

G. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches beyond the damaged area in all directions and taping all sides with manufacturer's recommended tape.

END OF SECTION 07 26 00

SECTION 07 27 00

SELF ADHERING, WATER RESISTIVE
VAPOR PERMEABLE AIR BARRIER MEMBRANE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. This Specification shall be read as a whole by all parties concerned. Each Section may contain more or less the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their Work and coordinate overlapping Work.

1.02 SYSTEM DESCRIPTION

A. Supply labor, materials and equipment for a fully adhered water-resistive vapor permeable air barrier membrane system.

B. Complete Work as shown on the Drawings and specified herein to bridge gaps and seal the water-resistive vapor permeable air barrier membrane against air leakage and water intrusion.
1. Connections of the walls to the roof membrane
2. Connections of the walls to the foundations
3. Seismic and expansion joints
4. Openings and penetrations of window and door frames, store front, curtain wall
5. Piping, conduit, duct and similar penetrations
6. Masonry ties, screws, bolts and similar penetrations
7. All other air leakage pathways in the building envelope

C. Install primary water-resistive vapor permeable air barrier, flashing, and ventilation strip accessories.

1.03 RELATED SECTIONS

A. Section 05 40 00 – Cold Formed Metal Framing

B. Section 06 01 01 – Rough Carpentry

B. Section 07 26 00 – Sheet Metal Flashing and Trim

D. Section 07 42 43 – Composite Wall Panel System

1.04 REFERENCE STANDARDS

A. American Association of Textile Chemists and Colorists (AATCC): ATCC 127 - Test Method for Water Resistance: Hydrostatic Pressure Test.

B. ASTM International (ASTM):

1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 96/96M - Test Methods for Water Vapor Transmission of Materials.
3. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
4. ASTM E 2178 - Standard Test Method for Air Permeance of Building Materials.
5. ASTM E 2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

C. International Code Council Evaluation Service, Inc. (ICC-ES): ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.

1.05 SUBMITTALS

A. Submit manufacturers' current product data sheets, details and installation instructions for the water-resistive vapor permeable air barrier membrane components and accessories.

B. Submit samples of the following:
1. Manufacturer's sample warranty
2. Water-resistive vapor permeable air barrier sheet, minimum 8 by 10 inches
3. Components, minimum 12-inch (305-mm) lengths
4. Membrane flashings
5. Fasteners, clips, strapping and Ties
6. Sealants

1.06 QUALITY ASSURANCE

A. Single Source: Self-adhered water-resistive vapor permeable air barrier membrane components and accessories must be obtained as a single-source membrane system to ensure total system compatibility and integrity.

B. Manufacturer Qualifications
1. Manufacturer of specified products listed in this Section to have minimum 10 years of continued experience in the manufacture and supply of highly vapor permeable water resistive air barrier products successfully installed in similar project applications.
2. Manufacturer of specified products listed in this Section to have experienced in-house technical and field observation personal qualified to provide expert technical support.

C. Fire Performance Characteristics: Provide water-resistive barrier meeting the following fire-test characteristics.
1. Surface-Burning Characteristics: ASTM E 84
2. Flame spread index: 25 or less
3. Smoke developed index: 450 or less

1.07 MOCK-UP

A. Construct mock-up in accordance with Section 07 42 43 – Composite Metal Panels.

B. Provide mock-up of specified water-resistive vapor permeable air barrier materials under provisions of Section 01 33 00 – Submittals.

C. Incorporate membrane assembly into the full scale mock-up panel.
1. Perform water spray test of mockup to demonstrate performance.

D. Allow 48 hours for inspection of mock-up Architect before proceeding with water-resistive vapor permeable air barrier work. Mock-up may remain as part of the Work.

1.08 PRE-INSTALLATION CONFERENCE

A. Contractor shall conduct a pre-installation conference one week prior to commencing Work of this section.

B. Ensure all contractors responsible for creating a continuous plane of water and air tightness are present.

1.09 DELIVERY, STORAGE AND HANDLING

A. Refer to current Product Installation Instructions for proper storage and handling.

B. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

C. Store roll materials on end in original packaging. Protect rolls from direct sunlight and inclement weather until ready for use.

D. Wasted Management and Disposal:
1. Separate and recycle waste materials in accordance with Waste Management Plan

1.10 COORDINATION

A. Ensure continuity of the self-adhered water-resistive vapor permeable air barrier system throughout the scope of this section.

1.11 ALTERNATE MANUFACTURERS

A. Manufacturers other than the manufacturer listed as basis of design will be considered in strict accordance with section 01 63 00. All acceptable manufacturers will be confirmed by addenda.

1.12 WARRANTY

A. Provide manufacturer’s standard material warranty in which manufacturer agrees to provide replacement material for the self-adhered water-resistive vapor permeable air barrier sheets installed in accordance with manufacturer's instructions that fails due to material defects within 20 years of the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Primary self-adhered water-resistive vapor permeable air barrier membrane components and accessories must be obtained as a single-source to ensure total system compatibility and integrity.

1. Basis of Design: WrapShield SA, by VaproShield
2. Architect Approved Equal prior to Bid

B. WATER-RESISTIVE VAPOR PERMEABLE AIR BARRIER MATERIALS

1. Primary self-adhered air barrier sheet membrane shall be Self-Adhered Water-Resistive Vapor Permeable Air Barrier Sheet and be a zero VOC self-adhered vapor permeable air barrier sheet membrane consisting of multiple layers of UV stabilized spun-bonded polypropylene having the following properties:
   a. Allowable UV exposure for 180 days
   b. Air Leakage: <0.01 cfm/ft. sq. when tested in accordance with ASTM E 2357 and < 0.0000263 cfm/sq. ft. @ 75 Pa (0.000134 L/s/m sq @ 75 Pa) when tested in accordance with ASTM E 2178

c. Water Vapor Permeance tested to ASTM E 96 Method B: 50 perms (2875ng/Pa.s.m^2)
d. Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage
e. Tensile Strength tested to ASTM D 882: 44.8 lbf/inch (78 N/mm), machine direction; 25 lbf/inch (43.8 N/mm), cross-machine direction
f. Application Temperature: Ambient temperature must be above 20 degrees F
g. Surface Burning Characteristics tested to ASTM E 84: Class A, Flame-spread index of less than 10, Smoke-development index of less than 15
h. Physical Dimensions: 0.026 inches (0.65 mm) thick and 59 inches (1.5 m) wide and 8.26 oz per sq. yd.

C. WATER-RESISTIVE VAPOR PERMEABLE TRANSITION AND FLASHING MEMBRANE

1. Self-adhered air barrier transition and flashing membrane shall be a zero VOC self-adhered water-resistive vapor permeable membrane having the following properties:
   a. Size: 11-3/4 inches or 19 2/3 inches wide x 164 feet long
   b. Air Leakage: < 0.0000263 cfm/sq. ft. @ 75 Pa (0.000134 L/s/m sq @ 75 Pa) when tested in accordance with ASTM E 2178
   c. Water Vapor Permeance tested to ASTM E 96 Method B: 50 perms (2875ng/Pa.s.m^2)
   d. Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage

D. VAPOR PERMEABLE WATER RESISTIVE FLASHING FOR ROUGH OPENINGS

1. Window and door flashing shall be a liquid-applied vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane.

E. SELF-ADHEARED, NEOPREN/EPDM SHIM

1. Neoprene shim placed under horizontal and vertical cladding attachment components.

2.02 PENETRATION SEALANT

A. Provide sealant for penetrations as recommended by manufacturer and as specified under Division 07 Section: Sealants. Appropriate sealants shall be VaproBond or VaproLiqu-Flash.

PART 3 EXECUTION

3.01 GENERAL

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
B. All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier membrane and flashings. Fill voids and gaps in substrate greater than ¼ inch in width to provide an even surface. Strike masonry joints full-flush.
C. Minimum application temperature self-adhered membrane and flashings to be above 20 degrees F (minus 6.0 degrees C).
D. Ensure all preparatory Work is complete prior to applying primary self-adhered vapor permeable

air barrier sheet membrane.

E. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

3.02 COORDINATION OF SELF-ADHERED VAPOR PERMEABLE AIR BARRIER MEMBRANE INSTALLATION

A. Self-adhered vapor permeable air barrier sheets may be installed horizontally over the outside face of exterior sheathing board or substrate.

B. Complete detail Work around corners, wall openings, building transitions and penetrations prior to field applications.

C. Install self-adhered vapor permeable air barrier sheet over the outside face of exterior sheathing board or substrate, measure and pre-cut into manageable sized sheets to suit the application conditions.

D. Install self-adhered vapor permeable air barrier sheet complete and continuous to substrate in a sequential overlapping weatherboard method starting at bottom or base of wall and working up.

E. Stagger all end lap seams.

F. Roll installed membrane with a two-handed roller to ensure positive contact and adhesion with substrate immediately.

3.03 BUILDING TRANSITION CONDITIONS

A. Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials with self-adhering air barrier transition and flashing membrane.

B. Align and position self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Provide minimum 3 inch lap on to substrates.

C. Ensure minimum 3 inch overlap at side and end laps of membrane.

D. Roll membrane and lap seams with roller to ensure positive contact and adhesion.

3.04 WINDOW, DOOR AND OTHER WALL OPENINGS

A. To avoid waste, predetermine best method and sequence to the install self-adhered air barrier transition and flashing membrane around window or wall openings subject to the opening size and installation of window, door or louver type.

B. Wrap self-adhered air barrier transition and flashing membrane into wall openings 2-3/4” to cover sill, jambs and head. It is not required to install continuous sheets through corners.

C. Remove release film, align flashing membrane and apply pressure to ensure positive contact. Roll Lap seams to ensure adhesion. Provide lap seams to shed water.

D. Install preformed self-adhered corner flashing membrane into corners over flashing membrane.

E. Subject to window installation requirements, install preformed sill pan system and seal to installed self-adhered air barrier window flashing membrane with sealant.

F. Install windows in accordance with window manufacturer's details and cover nail flange with flashing tape. Install flashing tape along jamb and across head flanges of window and seal to installed self-adhered air barrier transition membrane. Roll tape to ensure positive contact to substrate. Seal exposed leading edge of tape.

G. For windows without nail flange, install specified aluminized tape around perimeter of opening to accommodate placement of backer rod and sealant between window frame and self-adhered vapor permeable air barrier membrane.

3.05 MECHANICAL EQUIPMENT PENETRATIONS

A. Mechanical pipe, electrical conduit and/or duct work must be secured solid into position prior to installation of self-adhered vapor permeable air barrier membrane.

B. Electrical services penetrating the wall assembly and self-adhered vapor permeable air barrier membrane must be placed in appropriate conduit and secured solid into position.

C. Install manufactured flanged penetration sleeves as recommended by sleeve manufacturer.

D. For straight sided penetrations, cut and fit self-adhered vapor permeable air barrier to accommodate sleeve, install specified single sided flashing tape to seal the air barrier membrane to ductwork or preformed flange sleeve.

E. For pipe penetrations, refer to manufacturer's standard details.

3.07 HORIZONTAL APPLICATIONS

A. For horizontal applications, align sheets and begin installation of water-resistive weather barrier at bottom or lowest point of wall.

B. To avoid wrinkles and miss-alignment of subsequent applications it is recommended to pre-mark or "Snap" a level line to work from. Measure and pre-cut into manageable sized sheets to suit the application conditions.

C. Allow for excess material at bottom of wall to accommodate tie-ins and connections to adjacent surfaces.

D. Align and position self-adhered membrane, remove release film and press firmly into place. Provide minimum 3 inch overlap at all side and end laps of membrane. Roll membrane and lap seams with roller to ensure contact and adhesion.

E. Continue to remove release film and apply pressure to ensure positive contact onto wall substrate.

F. Install subsequent sheets of self-adhered vapor permeable air barrier sheets in overlapping weatherboard format. Ensure sheets lay smooth and flat to surfaces. Roll membrane and lap seams with roller to ensure contact and adhesion.

G. Refer to http://vaproshield.com/installation/instructions for the most current and complete installation instructions.

3.09 FASTENING CLIPS AND MASONRY TIES

A. Install clips and masonry ties over primary self-adhered vapor permeable air barrier membrane.

B. Secure clips and masonry ties with corrosion-resistant, or stainless steel screws with gasketed fasteners.

3.10 FIELD QUALITY CONTROL

A. Make notification when sections of work are complete to allow review prior to covering self-adhered water-resistive vapor permeable air barrier system.

B. Owner to engage independent consultant to observe substrate and membrane installation prior to placement of cladding systems and provide written documentation of observations.

3.11 PROTECTION

A. Protect wall areas covered with self-adhered water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.

B. Review condition of self-adhered water-resistive vapor permeable air barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.

C. Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed self-adhered water-resistive vapor permeable air barrier installations.

D. Remove and replace water-resistive weather barrier membrane affected by chemical spills or surfactants.

END OF SECTION 07 27 00

SECTION 07 42 43

COMPOSITE METAL PANELS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. The extent of panel system work is indicated on the Drawings and in these specifications.
2. Panel system requirements include the following components:

    a. Aluminum-faced composite panels with mounting system. Panel mounting system including anchorages, furring, fasteners, gaskets and sealants, related flashing adapters and masking for a complete installation.
    b. Soffits, sills, border and filler items may be indicated as integral components of the panels system or as designed.
    c. All flashing metal required shall be provided by the panel manufacturer.
    d. System to be fabricated and installed per local code requirements.

B. Related Documents: Drawings and general provisions of the contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

1. Division 5 Section “Cold Formed Steel Framing”
2. Division 7 Section “Metal Soffits”
3. Division 7 Section “Self Adhering Water Resistive, Vapor Permeable Air Barrier”

1.02 QUALITY ASSURANCE

A. Composite panel manufacturer shall have a minimum of 10 years’ architectural experience in the manufacture of this product and be located within the continental USA.

B. Contractor’s Fabricator shall be acceptable to composite panel manufacturer.

C. Contractor’s Fabricator and Contractor’s Installer shall have a minimum 5 years’ experience in architectural metal panel work similar in scope and size to this Project.

D. Coordinate fabrication schedule with construction progress to avoid delay of work.

E. Shop Drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration, on the inside face of the panel system as determined by ASTM E331.

F. Maximum deviation from vertical and horizontal alignment of erected panels: 6 mm (1/4") in 6 m (20') non-accumulative.

G. Contractor shall assume responsibility for all components of the exterior panel system, including but not limited to, attachment to sub-construction, panel-to-panel joinery, panel-to-dissimilar-material joinery and joint seal associated with the panel system.

1.03 REFERENCES

A. American Society for Testing and Materials

1. E330: Structural Performance of Exterior Windows, Curtain Walls and Doors under the Influence of Wind Loads.
2. E283: Rate of Leakage through Exterior Windows, Curtain Walls and Doors.
3. D1781: Climbing Drum Peel Test for Adhesive Materials.
4. E84: Surface-Burning Characteristics of Building Materials.
5. E283: Air Performance of Exterior Windows, Curtain Walls and Doors.

6. D3363: Method for Film Hardness by Pencil Test.
7. D2794: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
8. D3359: Methods for Measuring Adhesion by Tape Test.
9. D2247: Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
10. B117: Method of Salt Spray (Fog) Testing.
11. D822: Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products.
12. D1308: Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
13. D1735: Method for Water Fog Testing of Organic Coatings.
14. D1929: Standard Test Method for Determining Ignition Temperature of Plastics.
15. D635: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in Horizontal Position.

1.04 MOCK-UPS

A. At location on building and to extent directed by Architect, install areas of specified wall panels, support framing, flashing, trim and accessories to show:

1. Substrate preparation
2. Support framing, furring, and flashing
3. Clearances and gaps between members
4. Fastening methods
5. Trim details
6. Joint protection
7. Workmanship

B. Prepare mock-up for Architect’s approval before start of wall panel work. Prepare additional mock-ups, if required by Architect, until approved.

C. Maintain approved mock-up during construction to establish required standard of workmanship and basis of comparison for installation of wall panel work. Approved mock-up may remain as part of finished work.

1.05 SUBMITTALS

A. Samples:

1. Panel assembly: Two (2) samples of each type of assembly, 304 mm (12”) x 304 mm (12”) minimum.
2. Two (2) samples of each color or finish selected, 76 mm (3") x 102 mm (4") minimum.

B. Shop Drawings: Submit shop Drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

C. Manufacturer’s literature shall certify that material meets specifications.

D. Fabrication Tickets: Submit fabrication Drawings showing location and type of aluminum-extruded stiffeners at typical panels and at corner panels, if required.

E. Fabricator and installer’s qualification confirming both meet quality assurance requirements stated below.

1.06 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Conduct pre-installation conference at site attended by Contractor, Owner, Architect, and Manufacturer's Technical Representative, and other relevant trade contractors. Purpose of meeting shall be to:

1. Coordinate building framing in relation to composite wall panel system.
2. Coordinate installation of building air and water barrier behind composite wall panel system.
3. Coordinate window, door and louver, and other openings and penetrations of composite wall panel system.

1.07 QUALITY ASSURANCE

A. MCM Manufacturer Qualifications

1. MCM Manufacturer Qualifications: Company with a minimum of 10 years of continuous experience manufacturing MCM of the type specified.
   a. Able to provide specified warranty on finish.
   b. Able to provide a list of other projects of similar size, including approximate date of installation and name of Architect for each.
   c. Able to produce the composite material without outsourcing of the fire-resistant core manufacture and compounding, or panel bonding process.

B. MCM Fabricator Qualifications

1. MCM system fabricator will have at least (3) years of continuous documented experience fabricating the panel material type specified.
2. MCM system fabricator will have been in business under its present name for at least five (5) years prior to the start of this project.
3. MCM system fabricator will be capable of providing field service representation during construction.
4. MCM system fabricator will not have filed for protection from creditors under state or federal insolvency or debtor relief statues or codes

C. MCM System Installer Qualifications

1. MCM system fabricator will have been in business under its present name for at least five (5) years prior to the start of this project and have experience with similar sized MCM system projects.
2. MCM system fabricator will be capable of providing field service representation during construction.
3. The MCM System Installer must be an approved installer by the MCM Fabricator for the installation of their MCM System and have undergone proper training for the specified system thereof.

1.08 WARRANTY

A. The fabricator and installer will warrant the wall system for a period of two (2) years that the fabrication and installation workmanship will be free from defects.

B. The aluminum composite material manufacturer shall warrant for a period of 30 years against Max 5 fade based on ASTM D2244 and Max 8 chalk based on ASTM D4212 and delamination of the paint. Warranty term shall begin at project substantial completion.

C. The contractor is responsible for completing warranty application and all work required for to obtaining validated manufacture.

1.09 PACKAGING, SHIPPING AND HANDLING

A. Follow manufacturer's recommendations.

B. Store material in accordance with panel manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Composite Wall Panels

1. Basis of Design: Alfrex, LLC, 943 Gainesville HWY, Building 100, Suite 4000, Buford, GA 30518; Phone (470) 589-7449; Website: http://alfrexusa.com/; Email: alfrex@alfrexusa.com.
2. Centria, FormabondII Composite Wall Panel System.
3. **Reynobond (ACM)**
4. Or Architect approved equal prior to bid.

B. Fire Resistant Metal Composite Material

1. Alfrex FR
2. Description: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic fire-resistant material formed in a continuous process with no glues or liquid adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products that are laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.
3. MCM Thickness: 4mm (0.157 inch)
4. MCM Face Sheets:
   a. Front Face: 0.5mm (0.020”) nominal
   b. Fire Resistant Mineral Core: 3.0 mm (0.117 inch) nominal
   c. Back Face: 0.5mm (0.020”) nominal
5. Aluminum Alloy: 3003-H16
6. Weight: 1.51 lb/ft2 (7.37 kg/m2)
7. Finishes:
   a. Coil coated KYNAR® 500 or HYLAR® 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene - Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605.
      1. Color: 2-Coat Mica, Champange Mica JY-2550
      2. Dry Film Thickness:
         a) 2-Coat: 1.0mil (±0.2mil).
      3. Hardness: ASTM D-3383; HB minimum using Eagle Turquoise Pencil.
      4. Impact Resistance:
         a) Test Method: ASTM D_2794; Gardner Variable Impact Tester with 5/8" mandrel.
         b) Coating shall withstand reverse impact of 1.5”/pounds per mil substrate thickness.
         c) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
      5. Adhesion:
         a) Test Method: ASTM D-3359: Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
      6. Humidity Resistance:
         a) Test Method: ASTM D-2247.
         b) No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
      7. Salt Spray Resistance:

a) Test Method: ASTM B-117; Expose coating system to 4000 hours, using 5% NaCI solution,
b) Corrosion creepage from scribe line: 1/16" max.
c) Minimum blister rating of 8 within the test specimen field.

8. Weather Exposure:
   a) Outdoor:
      1) Ten-year exposure at 45° angle facing south Florida exposure.
      2) Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.
      3) Minimum chalk rating of 8 in accordance with ASTM D-4214. d) No checking, crazing, adhesion loss.
9. Chemical Resistance:
   a) ASTM D-1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
   b) ASTM D-1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
   c) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.

2.02 PANEL FABRICATION

A. Reynobond® panels comprised of two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process using no glues or adhesives between dissimilar materials. The core shall be free of voids and/or air spaces and not contain foamed insulation materials. The bond between the core and the skins shall be a chemical bond. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. Aluminum Face Sheets:

1. Thickness: 0.020"
2. Aluminum alloy shall be 3000 series or equivalent.

C. Tolerances:

1. Panel Bow: Shall not exceed 0.8% of panel overall dimension in width or length.
2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible. Panel dimensions shall be such that there will be an allowance for field adjustment and thermal movement.
3. Panel Lines: Breaks and curves shall be sharp and true, and surfaces free of warps or buckles.
4. Flatness: Panels shall be visually flat.
5. Panel Surfaces: Shall be free of scratches or marks caused during fabrication.

D. System Characteristics:

1. Plans, elevations, details, characteristics and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. Fabricate panel system to dimension, size and profile indicated on the Drawings based on a design temperature of 68ºF (20ºC).
4. Fabricate panel system to avoid compressive skin stresses. The installation detailing shall be such

that the panels remain flat regardless of temperature changes and at all times remain air- and watertight.

5. The finish side of the panel shall have a removable protective film applied prior to fabrication, which shall remain on the panel during fabrication, shipping and erection to protect the surface from damage.

E. System Type:

1. Rout-and-Return Dry System: Fabricator and installer must provide an engineered pressure relief system including extruded perimeter frame; drainage gutter; all extrusions, clips, fasteners, anchors, spacers, trim, flashings, gaskets, sealant, etc.

2.03 MCM PRODUCT PERFORMANCE

A. Bond Integrity: Tested for resistance to delamination as follows:

1. Peel Strength (ASTM D1781): 22.5 in-lb/in (100 N-m/m) minimum.
2. No degradation in bond performance after 8 hours of submersion in boiling water at 212 degrees Fahrenheit, (100 degrees Celsius).
3. No degradation in bond performance after and 21 days of immersion in water at 70 degrees Fahrenheit, (21 degrees Celsius).
4. Thermally bonded to the fire-resistant core material in a continuous process under tension.

B. Fire Performance:

1. Flamespread, ASTM E84: <25.
2. Smoke Developed, ASTM E84: <450.
3. Surface Flammability, Modified ASTM E108: Pass.
4. Ignition Temperature:
   a) Flash, ASTM D1929: 716 degrees F (380 degrees C).
   b) Ignition: 752 degrees F (400 degrees C).
5. Flammability, Exterior, Non-load-bearing wall assemblies and panels, NFPA 285: Pass.

C. Production Tolerances:

1. Width: +/- 0.080 inch (2.0 mm)
2. Length: + 0.197 inch (5 mm)
3. Thickness (4 mm Panel): +/- 0.008 inch (0.2 mm)
4. Bow: Maximum 0.2% length or width.
5. Squareness: Maximum 0.157 inch (4 mm)

2.04 FABRICATION

A. General: Shop fabricate to sizes and joint configurations indicated on drawings.

1. Fabricate panels too dimensions indicated on drawings based on an assumed design temperature of 70°F (21°C). Allow for ambient temperature range at time of fabrication.
2. Formed MCM panel lines, breaks and angles to be sharp and true, with surfaces that are free from warp or buckle.
3. Fabricate panels with sharply cut edges and no displacement of face sheet or protrusion of core.

B. Fabrication Tolerances: Shop-fabricate panels to sizes and joint configurations indicated on drawings.

1. Width: +/- 0.079 inch [+/- 2 mm] @ 70°F (21°C)
2. Length: +/- 0.079 inch [+/- 2 mm] @ 70°F (21°C)
3. Squareness: +/- 0.079 inch [+/- 2 mm] @ 70°F (21°C)

2.05 ACCESSORIES

A. Extrusions, formed members, sheet and plate shall conform with ASTM B209 and the recommendations of the manufacturer.

B. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

C. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.

D. Fabricate flashing materials with .040" minimum thickness aluminum sheet. Sheets to be provided by panel manufacturer to match the adjacent curtain wall/panel system where exposed. Post-painted spray-applied flashings are not acceptable. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bead of non-hardening sealant.

E. Fasteners (concealed/non-corrosive): Fasteners as recommended by system fabricator and installer.

F. Panel Underlayments:

1. Basis of Design: WrapShield SA by VaproShield
   a. Grace Ice and Water Shield HT
   b. Carlisle CCW WIP 300HT
   c. Or Architect Approved Equal Prior to Bid.
2. Material: Cold applied, self-adhering membrane composed of a rubberized asphalt adhesive and inter-wound with a disposable release sheet. An embossed, slip resistant surface is provided on the high performance film with UV barrier properties.
   a. Membrane Thickness: 75 mils (1.02 mm) per ASTM D3767 Method A.
   b. Maximum Permeance: 0.05 perms (2.9 ng/sgms Pa) per ASTM E96.
   c. Service Temperature: 240 degrees F (115.6 degrees C) per ASTM D1204
   d. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
   e. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.
   f. Codes: Must comply with all national building codes as well as those specified in this specification section.

PART 3 – EXECUTION

3.01 MCM FABRICATOR/INSTALLER INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions.

3.02 EXAMINATION AND PREPARATION

A. Verify that conditions of substrates previously installed under other sections or divisions are acceptable for MCM system installation. Documentation should be provided indicating any conditions detrimental to the performance or installation of the MCM System.

1. Notify Architect of unacceptable conditions once discovered.

2. Proceed with preparation and installation only after unacceptable conditions have been corrected.

B. Field Measurements:

1. If required per project conditions, field measurements of the site condition are to be taken prior to beginning fabrication work and notification of any material modifications and resulting schedule adjustment shall be formally documented.

2. Field measurements are to be made once all substrate and adjacent materials are installed, verifying the locations of wall framing members and wall opening dimensions before commencement of installation. Indicate measurements on the “As Built Shop Drawings”.

C. Project Schedule: Provisions in the project schedule must accommodate the time interval between field measurements and fabrication/installation.

D. Miscellaneous Framing: Install miscellaneous MCM system support members and anchorage according to MCM System written instructions and drawings supplied by the MCM System Fabricator.

3.03 INSTALLATION

A. General:

1. Install panels plumb, level and true in compliance with fabricator’s recommendations.
2. Anchor panels securely in place in accordance with fabricator’s approved shop drawings.
3. Comply with fabricator’s instructions for installation of concealed fasteners and with provisions of Section 07 90 00 for installation of joint sealers.
4. Installation Tolerances: Maximum deviation from horizontal and vertical alignment of installed panels: 0.25 inch in 20 feet (6.4 mm in 6.1 m), noncumulative.
5. Separate contact of dissimilar metals with bituminous paint, approved plastic shims, or other approved methods as defined within the Aluminum Design Manual (ASD). Use gasketed or approved coated fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

B. Related Products:

1. General: Refer to other related sections in Related Sections paragraph specified herein for related materials, including cold-form metal framing, flashing and trim, joint sealants, aluminum windows, glass and glazing and curtain walls.

3.04 FIELD QUALITY REQUIREMENTS

A. Field Quality Control: Comply with panel system fabricator’s recommendations and guidelines for field forming of panels.

B. Field Quality Control: When required by contract, mock up shall be constructed and tested at the expense of the Architect/Owner/General Contractor.

C. Testing Agency: If required, the Owner shall engage a qualified testing agency top perform tests and inspections.

D. Fabricator’s Field Services: Upon Owner’s request, provide fabricator’s field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with fabricator’s instructions.

3.05 ADJUSTING AND CLEANING

A. ADJUSTING

1. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement are the responsibility of the General Contractor.

2. Removal of panels damaged by other trades is the responsibility of the General Contractor.
3. Repair components of the MCM system that present with minor damage provided said repairs are not visibly apparent at a distance of 10 feet (3m) from the surface at a 90° angle per AAMA 2605.
4. Remove and replace components of the MCM system damaged beyond repair.
5. Remove protective film immediately after installation of MCM and immediately prior to completion of the MCM system work. Protective film intentionally left in place after panel installation on any elevation at the direction of the General Contractor, is the responsibility of the General Contractor.
6. Any additional protection, after installation, is the responsibility of the General Contractor.
7. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
8. Promptly remove from the jobsite any damaged MCM panels, protective film, and other debris attributable to MCM system and installation, and legally dispose of said materials.

B. CLEANING

1. After MCM system installation remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 PROTECTION

A. Protect installed products from damage during subsequent construction work until final inspection and acceptance by Owner

3.07 ADJUSTING AND CLEANING

A. Remove and replace panels damaged beyond repair as a direct result of panel installation.

B. Repair panels with minor damage.

C. Remove masking film (if used) as soon as possible after installation.

D. Protection, provided after installation, shall be the responsibility of the Contractor to remove.

E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

END OF SECTION 07 42 43

SECTION 07 42 93

METAL SOFFITS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes: Factory-formed metal soffit panels, including flashing and accessories.

B. Related Sections: Drawings and general provisions of the contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section:

1. Division 7 Section “Sheet Metal Flashing and Trim”
2. Division 7 Section “Roof Specialties and Accessories”
3. Division 7 Section “Joint Sealants”

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

ASTM E330 – Uniform Load Test

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

SMACNA Architectural Sheet Metal Manual

1.03 SYSTEM DESCRIPTION

A. Provide sheet metal soffit panels that have been manufactured, fabricated and installed to maintain manufacturer’s performance criteria without defects, damage, or failure of infiltration of water.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

1. Product Data: Submit product data, including manufacturer’s product sheet, for specified products.

B. Shop Drawings:

1. Submit complete shop Drawings and erection details for review. Do not proceed with manufacturer of soffit and ceiling panel materials prior to review of shop Drawings and field verification of all dimensions. Do not use Drawings prepared by the Architect for shop or erection Drawings.
2. Shop Drawings shall show soffit plans and installation details.

C. Performance Tests:

1. Submit certified test results complying with ASTM E330 by a recognized testing laboratory in accordance with specified test methods for each panel system.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:

1. Contractor’s Installer Qualifications: Submit Contractor’s Installer Qualifications documents per requirements set forth below.
2. Manufacturer’s Instructions: Manufacturer’s installation instructions.

F. Warranty: Submit sample warranty for review.

G. Closeout Submittals: Submit the following:

1. Operation and Maintenance Date: Operation and maintenance data for installed products in accordance with Division 1 Specification Sections 01 77 00 Contract Closeout and 01 78 20 Operations and Maintenance Data. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Project Warranty: Warranty documents specified herein.
   a. Manufactures Warranty: Submit, for Owner's acceptance, manufactures standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not limited of, other rights the Owner may have under the Contract Documents.
      1. Warranty Period: (20) years commencing on Date of Substantial Completion.

1.05 QUALITY ASSURANCE

A. Contractor's Installer Qualifications: Contractor's Installer shall be experienced in performing work of this section and who has specialized in the installation of work similar to that required for this Project.

1. Contractor's Panel Applicator must have a minimum of five (5) years of experience in the application of metal soffit panels.
2. Certificate: Provide a certificate indicating qualifications.
3. Contractor's Panel Applicator must be factory trained by the panel system manufacturer prior to the bid date in order to obtain a contract for installation.
4. Use adequate members of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) *Architectural Sheet Metal Manual*.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

1. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.

1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
2. Prevent contact with material that may cause corrosion, discoloration or staining.

1.07 WARRANTY

A. Type/Term: Provide a 20-year manufacturers finish warranty for Kynar 500 or Hynar 5000 finish for the metal soffit panels as supplied by the manufacturer. This warranty shall be for a period of 20 years from the date of Substantial Completion and shall cover chalking in accordance with ASTM D-4214-89 method A (D659) number 8 rating; fading with a color change of less than or equal to 5.0 Hunter E units as determined by ASTM Method D-2244-02 after removal of external deposits and chalk, and overall integrity of the finish against cracking, checking, peeling or loss of adhesion.

PART 2 – PRODUCTS

2.01 SHEET METAL SOFFIT

A. Manufacturer:

1. Petersen Aluminum Corporation, Acworth, GA 800-272-4482 (Basis of Design)
2. Or Architect approved equal prior to Bid**.**

B. Exterior Soffit Panels:

1. Type: FLUSH Soffit Panel
2. Material: 24 ga. steel
3. Panel Dimension: 12in wide
4. Texture: Smooth

C. Panel Finish:

1. Panel Topside:
   a. PAC-CLAD finish' color selected from Petersen Aluminum Corp. **Premium Metallic** Colors.
   b. Color:
      i. Exterior Soffit & Ceiling Panels: Metallic Colors, Silversmith
2. Panel Underside: Polyester wash coat with dry film thickness of 0.3 mils.

E. Other manufacturers are acceptable pending approval of the Architect prior to Bid. Contractor shall note that it is the intent of these Documents that the standing seam metal roof, soffit panels, trim, and accessories shall be sole source and covered under the full system warranty required.

2.02 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Sealants: Elastomeric joint sealants. Refer to Division 7 Joint Sealant Section.

2.03 FABRICATION

A. General:

1. Continuous Length: **Fabricate all metal panels in one continuous length.**
2. Trim and Flashings: Fabricate trim and flashings from same material as metal panel system material.
3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2.04 FINISHES

A. Factory Applied Finish:

1. Topside: Full-strength fluoropolymer 70% Kynar 500 system of 1.0 mil total dry film thickness.
2. Underside: Wash coat of 0.3 - 0.4 mil dry film thickness.
3. Texture: Smooth texture.
4. Protective film: Strippable vinyl film applied during panel fabrication and finishing.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of metal panels.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for Project installation in accordance with manufacturer's instructions.

3:03 PREPARATION

A. Coordination: Coordinate metal panels with roofing, drainage, flashing and trim, deck substrates, parapets, copings, walls and other adjoining work to provide a non-corrosive and leak-proof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.04 INSTALLATION

A. General: Install metal panels to profiles, patterns and drainage indicated on Drawings. Provide for structural and thermal movement at work.

1. Seams: Provide uniform, neat seams.
2. Fasteners: Conceal fasteners where possible in exposed work.
3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for Sealant installation.

3:05 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post Installation Testing): Owner reserves right to perform post installation testing of installed sheet metal panels.

B. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3:06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from Project site and legally dispose of debris.

3:07 PROTECTION

A. Protection: Protect installed product from damage during construction.

END OF SECTION 07 42 93

SECTION 07 54 23

TPO SINGLE PLY ROOFING AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermoplastic Polyolefin Single-Ply Roofing Membrane
2. Thermoplastic Polyolefin Flashings
3. Thermoplastic Polyolefin Accessories
4. Roof Insulation

B. Related Sections:

1. Section 06 10 00, Rough Carpentry
2. Section 07 15 00, Sheet Metal Flashing and Trim

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) - *Annual Book of ASTM Standards*

1. ASTM D-751 – Standard Test Methods for Coated Fabrics
2. ASTM D-2137 – Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
3. ASTM E-96 – Standard Test Methods for Water Vapor Transmission of Materials
4. ASTM D1204 – Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
5. ASTM D-471 – Standard Test Method for Rubber Property—Effect of Liquids
6. ASTM D-1149 – Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
7. ASTM G155 – Standard Practice For Operating Xenon Arc Light Apparatus For Exposure Of Non-Metallic Materials
8. ASTM D573 – Standard Test Method For Rubber - Deterioration In An Air Oven
9. ASTM D6878 – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
10. ASTM C-1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
11. ASTM C-1371 – Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
12. ASTM E 903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) – *Architectural Sheet Metal Manual*

C. National Roofing Contractors Association (NRCA)

D. American Society of Civil Engineers (ASCE)

E. Underwriters Laboratories (UL) – *Roofing Systems and Materials Guide* (TGFU R1306)

F. ENERGY STAR

G. Cool Roof Rating Council (CRRC)

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.04 SUBMITTALS

A. Product Data: Provide product data sheets for each type of product indicated in this section.

B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.

C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.

D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications: GAF® shall provide a roofing system that meets or exceeds all criteria listed in this section.

B. Installer's Qualifications:

1. Installer shall be classified as a ***Master Select™*** contractor as defined and certified by GAF®.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.

D. Final Inspection: Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.06 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, GAF® representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.07 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

B. GAF® shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.08 REGULATORY REQUIREMENTS

A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry either a GAF®MC or GAF® label.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range. Reference data sheets for product storage requirements.

C. Do not expose materials to moisture in any form before, during or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

1.10 PROJECT CONDITIONS

A. Weather:

1. Proceed with roofing only when existing and forecasted weather conditions permit.
2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

1.11 WARRANTY/GUARANTEE

A. Provide manufacturers standard **WeatherStopper® Diamond Pledge™ Guarantee**:

1. **Single source coverage** and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
   a) Duration: Twenty (20) years from the date of completion.
2. **Single source Edge to Edge coverage** and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship
   a) Duration: Twenty (20) years from the date of completion.
   b) **It is the intent of these documents for all roofing materials, accessories, copings scuppers downspouts and flashings to be covered under Edge to Edge warranty.**

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. GAF® - 1 Campus Drive, Pasippany, NJ 07054 (**Basis of Design**)

B. Carlisle SynTec Systems – Sure-Weld TPO Reinforced Membrane 60 mil

C. Johns Manville TPO – 60 mil

D. Versico – 60 mil Versiweld TPO

E. Architect approved equal.

2.02 INSULATION

A. Rigid polyisocyanurate board, with a strong white or black fibrous glass facer conforming to or exceeding the requirements of ASTM C 1289 / FS HH-I-1972. **EnergyGuard™ Polyiso**, with the following characteristics:

1. Board Thickness: 2 layers
2. Thermal Resistance (LTTR value) of: varies
3. For use at crickets and roof drains.

2.03 MEMBRANE MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane. Engineered to provide high solar reflectivity and extremely high UV and thermal resistance. These combined characteristics produce a single-ply membrane suitable for the most demanding solar installations as well as any other high heat or solar loading applications. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed and FM Approved. Each full roll contains approximately 1000 sq.ft. of roofing material, 10’ X 100’ Each half sheet roll contains approximately 500 sq.ft. of roofing material, 5’ X 100’. **EverGuard Extreme® TPO 60 mil** thermoplastic single-ply roofing membrane by GAF®.

2.04 COVER BOARD

A. Provide ½” Dens Deck roof cover board as indicated on Drawings.

2.05 FLASHING MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane. Engineered to provide high solar reflectivity and extremely high UV and thermal resistance. These combined characteristics produce a single-ply membrane suitable for the most demanding solar installations as well as any other high heat or solar loading applications. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed and FM Approved. Each full roll contains approximately 1000 sq.ft. of roofing material, 10’ X 100’ Each half sheet roll contains approximately 500 sq.ft. of roofing material, 5’ X 100’. **EverGuard Extreme® TPO 60 mil** thermoplastic single-ply roofing membrane by GAF®.

2.06 ADHESIVES, SEALANTS AND PRIMERS

A. Solvent-based Bonding Adhesive: Solvent based rubberized adhesive for use with EverGuard® TPO membranes, **EverGuard® 1121 Bonding Adhesive**, by GAF®.

B. Water-based Bonding Adhesive: Water based rubberized adhesive for use with EverGuard® TPO membranes, **EverGuard® WB181 Bonding Adhesive**, by GAF®.

C. Solvent based liquid, required to protect field cut edges of EverGuard® TPO membranes. Applied directly from a squeeze bottle, **EverGuard® TPO Cut Edge Sealant**, by GAF®.

D. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **EverGuard® TPO Primer**, by GAF®.

E. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, **EverGuard® TPO Seam Cleaner,** by GAF®.

F. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used. Available in 10 oz. tubes, **FlexSeal™ Caulk Grade** by GAF®.

G. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, **FlexSeal™** Roof Sealant, by GAF®.

H. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. **EverGuard® Water Block**, by GAF®.

I. 100% solids urethane based two-part sealant suitable for filling sealant pans at irregularly-shaped penetrations. **EverGuard® Two-Part Pourable Sealant**, by GAF®.

2.07 ACCESSORIES

A. Flashing Accessories:

1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. **EverGuard® TPO Detailing Membrane**, by GAF®.
2. An 8 inch (203 mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green **EverGuard® TPO Flashing Membrane**, by GAF®.
3. Decorative metal fascia with continuos galvanized steel spring cant to terminate membrane at perimeter, **EverGuard® Snap-on Fasia** by GAF®.
5. A 6 inch (152 mm) wide, 0.045 mil reinforced TPO membrane with a 3-inch self-adhered area and a 3-inch heat-weld area. Designed for use as a cover strip over coated and non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6” X 100’. **EverGuard® TPO Cover Tape Heat-Weld**, by GAF®.
6. .045” reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6” x 100’, **EverGuard® RTA (Roof Transition Anchor) Strip™,** by GAF®.
7. 24 gauge steel with 0.025” thick TPO based film as required for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. Standard sheet size 4’ x 10’, sheet weight 47 lbs. Custom sizes available, **EverGuard® TPO Coated Metal**, by GAF®.
   a) Color to be selected by Architect.

B. Wall & Curb Accessories:

1. .045” or .060” thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24”, 36”, 48”, and 60” in size. Four corners are required to flash the curb, **EverGuard® Corner Curb Wraps,** by GAF®.
2. 0.060” thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4” x 4” with 6” flange, **EverGuard® TPO Universal Corners** by GAF®.
3. 0.055” molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 6” x 6” x 5.5” high **EverGuard® TPO Preformed Corners** by GAF®.

C. Field Of Roof Accessories:

1. .055” thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. **EverGuard® T-Joint Patches**, by GAF®.

D. Pre-Finished Coping And Flashing:

1. Refer to specification section 07 15 00 Sheet Metal Flashing and Trim.
2. **It is the intent of these documents for all roofing materials, accessories, copings and flashings to be covered under roof warranty.**

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the surfaces and site conditions are ready to receive work.

B. Verify that the deck is supported and secured.

C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.

D. Verify that the deck surfaces are dry and free of ice or snow.

E. Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.02 SUBSTRATE PREPARATION

A. Structural Concrete Deck

1. Minimum 2,500 psi compressive resistance (98,066 kilogram-force/square centimeter)
2. The deck must be smooth, level and cannot be wet or frozen. If deck is determined to be wet, it must be allowed to dry.
3. The roof deck shall be properly cured prior to application of the roofing system; twenty-eight (28) days is normally required for proper curing. Curing agents must be checked for compatibility with roofing materials. Prior to the installation of the roof assemblies, GAF® recommends the evaluation of the surface moisture and deck’s dryness through the use of ASTM D-4263 or hot bitumen test.
4. Treat cracks greater than 1/8” (3 mm) in width in accordance with the deck manufacturer’s recommendations.

5. Sumps for the roof drains shall be provided in the casting of the deck.
6. For Pre-Cast Concrete Decks
   a) Minimum 2” (51 mm) deck thickness
   b) Joints must be filled with a masonry grout to correct imperfections between slabs and feathered to provide a slope not greater than 1/8:12 adhered insulated assemblies.
   c) If the joints cannot be grouted and finished smooth, then a leveling course of lightweight insulating concrete (minimum 2" [51 mm] thickness) must be applied. Do not seal joints between the slabs; leave open to permit venting and drying of the roof fill from below.

3.03 INSTALLATION - GENERAL

A. Install GAF®’s EverGuard® TPO roofing system according to all current application requirements in addition to those listed in this section.

B. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.04 PROTECTION LAYER

A. General:

1. The protection layer shall be installed between the roofing membrane and the substrate.
2. Install fiberglass sheet or polymat protection layer loose-applied over substrate surface so that wrinkles and buckles are not formed.
3. Overlap sheets a minimum of 6" (152 mm) for side and end laps.

3.05 MEMBRANE APPLICATION

A. Fully Adhered:

1. Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be fully adhered immediately after it is rolled out, followed by welding to adjacent sheets.
2. Overlap roof membrane a minimum of 3” (76 mm) for side laps and 3” (76 mm) for end laps.
3. Install membrane so that the side laps run across the roof slope lapped towards drainage points.
4. All exposed sheet corners shall be rounded a minimum of 1” (25.4 mm).
5. Use full width rolls in the field and perimeter region of roof.
6. Apply bonding adhesive at 3 squares of finished, mated surface area per 5 gallons (Solvent Based) and 5 squares of finished, mated surface area per 5 gallons (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition.
7. Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be fully adhered immediately after it is rolled out, followed by welding to adjacent sheets.
8. Membrane laps shall be hot-air-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.
9. Weld shall be a minimum of 1-1/2” (39 mm) in width for automatic machine welding and a minimum 2” (52 mm) in width for hand welding.
10. All cut edges of reinforced membrane must be sealed with EverGuard® TPO Cut Edge Sealant.

11. Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than five (5) degrees (1” in 12”). Roofing membrane shall be secured to the structural deck with appropriate Drill-Tec™ screws and plates spaced every 12” (610 mm) o.c. The screws and plates must be installed no less than ½” (13 mm) from the membrane edge. Alternatively, the roofing membrane may be turned up the vertical plane a minimum of 3” (76 mm) and secured with screws and termination bar Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 1-1/2” to 2” (39 mm to 52 mm) of the plane of the roof membrane, with a minimum of 1” (25.4 mm) of membrane extending above the termination bar.
12. Supplemental membrane attachment to the structural deck is required at all penetrations unless the insulation substrate is fully adhered to the deck. Roofing membrane shall be secured to the deck with appropriate Drill-Tec™ screws and plates.
13. Fasteners must be installed to achieve the proper embedment depth. Install fasteners without lean or tilt.
14. Install fasteners so that the plate or termination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate or termination bar to move (underdriving), but will not cause wrinkling of the membrane (overdriving).

3.06 FLASHINGS

A. General:

1. All penetrations must be at least 24” (610 mm) from curbs, walls, and edges to provide adequate space for proper flashing.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
4. Heat-weld all flashing membranes, accessories, and coated metal. A minimum 2” (52 mm) wide hand weld or minimum 1-1/2" (39 mm) automatic machine weld is required
5. All cut edges of reinforced membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
6. Consult the EverGuard® *Application and Specifications Manual* or GAF® Contractor Services for more information on specific construction details, or those not addressed in this section.

B. Coated Metal Flashings:

1. Coated metal flashings shall be formed in accordance with current EverGuard® construction details and SMACNA guidelines.
2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a ¼” (7 mm) gap to allow for expansion and contraction. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip to both sides of the joint, with approximately 1” (25.4 mm) on either side of the joint left un-welded to allow for expansion and contraction. 2” (52 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Heat-weld a 6” (152 mm) wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.
4. Provide a ½” (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.

5. Provide a ½" (13 mm) hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. Reinforced Membrane Flashings:

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with "Construction Detail Requirements".
3. Where flashings are to be fully adhered, apply bonding adhesive at a rate resulting in 60 square feet/gallon of finished roofing material for solvent-based bonding adhesives, and at a rate of 125 square feet/gallon of finished roofing material for water-borne bonding adhesive. Apply bonding adhesive to both the underside of the membrane and the substrate surface at 120 square feet per gallon (Solvent Based) and 250 square feet per gallon (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition. The bonding adhesive must be allowed to dry until tacky to the touch before flashing membrane application.
4. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application.
5. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.

D. Parapet And Building Walls:

1. Flash walls with EverGuard® TPO membrane adhered to the substrate with bonding adhesive, loose applied (Less than 24" (610 mm) in height) or with coated metal flashing nailed 4" (102 mm) on center to pressure-treated wood nailers.
2. Secure membrane flashing at the top edge with a termination bar. EverGuard® Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 8" on center; termination bars that are counter flashed shall be fastened 12" on center.
3. Roof membrane must be mechanically attached along the base of walls with screws and plates (deck securement) or screws and inverted termination bar (wall securement) at the following rate:
   a) Mechanically Attached Systems — Use side lap o.c. spacing, with a 12" (305 mm) maximum
   b) Fully Adhered System — 12" (305 mm) on center
   c) Ballast Applied Systems — 8" (152 mm) on center
4. All coated metal wall flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.
5. Metal counterflashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with Flexseal™ Roofing Cement or Flexseal™ Caulk Grade.
6. Flash wall scuppers with a coated metal insert that is mechanically attached to the wall and integrated as part of the wall flashing.

3.07 ROOF PROTECTION

A. Protect all partially and fully completed roofing work from other trades until completion.

B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.

C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.

D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.08 CLEAN-UP

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION 07 54 23

SECTION 07 72 33

ROOF SPECIALTIES AND ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Furnishing and installing factory fabricated roof hatch.

B. Related Work:

1. Division 6, Section “Rough Carpentry” for pressure treated blocking.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555.

1. ASTM A 36-93a: Standard Specification for Structural Steel

B. International Organization for Standardization (ISO), ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland; phone +41 22 749 01 11, fax +41 22 733 34 30.

1. ISO 9001:2008 Certified

C. NRCA “Roofing and Waterproofing Manual” details for installation of units.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: Submit manufacturer’s detailed technical product data, installation instructions and recommendations, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop Drawings: Indicate sections, profiles, accessories, location, dimensions and attachments to other units of Work. Also indicate layout, anchorage details, rough-in requirements and conditions on the roof.

D. Contract Closeout: Roof hatch manufacturer shall provide the manufacturer’s Warranty prior to the contract closeout. Warranty shall begin on date of Substantial Completion.

1.05 PRODUCT HANDLING

A. All materials shall be delivered in manufacturer’s original packaging.

B. Store materials in a dry, protected, well-vented area. The Contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

C. Remove protective wrapping immediately after installation.

1.06 JOB CONDITIONS

A. Verify that other trades with related work are complete before installing roof hatch.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the Construction Documents, shop Drawings, and manufacturer's installation instructions.

D. Coordinate installation with roof membrane and roof insulation manufacturer's instructions before starting.

E. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY/GUARANTEE

A. Manufacturer's Standard Warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of Substantial Completion.

PART 2 – PRODUCTS

2.01 ROOF HATCH

A. Manufacturer:

1. The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 800-366-6530, www.bilco.com - (Basis of Design)
2. Milcor, Inc.
3. Wasco Products, Inc.
4. Architect approved equal prior to bid. Refer to Specification Section 01 63 00 Product Substitution Procedures.

B. CONSTRUCTION AND MATERIALS

1. Furnish and install where indicated on Drawings metal roof hatch Type E-50TB, size width: 36" x 36". The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

2. Performance Characteristics:
   a. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
   b. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
   c. Operation of the cover shall not be affected by temperature.
   d. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.

3. Cover: Shall be 11 gauge aluminum with a 5" beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

4. Cover Insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3, fully covered and protected by an 18 gauge aluminum liner.

5. Curb: Shall be the height required to allow for 8" minimum flashing above the finished roof height on the upslope side of the curb. The curb shall be 11 gauge aluminum. The curb shall be formed with a 5-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.

6. Curb Insulation: Shall be 3" thick polyisocyanurate with an R-value = 20.3.

7. Lifting Mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe through bolted to the curb assembly.

8. Hardware:
   a. Heavy stainless steel pintle hinges shall be provided.
   b. Cover shall be equipped with a spring latch with interior and exterior turn handles.
   c. Roof hatch shall be equipped with interior padlock hasps.
   d. The latch strike shall be a stamped component bolted to the curb assembly.
   e. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
   f. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.
   g. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

9. Finishes: Factory finish shall be mill finish aluminum.

10. Provide LU-1 steel, safety yellow LadderUP safety post at all roof hatches.

2.02 SHIPS LADDER

A. Manufacturers:

1. Alaco Ladder Co. website: www.alacoladder.com
   Phone: 888-310-7040
2. Precision Ladder, LLC
3. Architect approved equal

B. Furnish and install where indicated on plans: Model H-1000-75 (775-75) with 1-1/4" schedule 40 handrails

C. Construction and Material:

1. Material: 6061-T6 aluminum alloy
2. Capacity: 1000lb total, 500lb. per step
3. Treads: 36"x 6" steps at 12" O.C. with non-slip ridges.
4. Mounting: (2) brackets at top; (2) brackets at floor. Provide blocking at connection points.
5. Angle: 75 degrees
6. Width: 36"

7. Height: 18’-0” verify dimension in field prior to fabrication.
8. Finish: Mill

2.03 HATCH RAIL SYSTEM

A. Manufacturer:

1. Basis-of-Design Manufacturer: Type Bil-Guard 2.0 roof hatch railing system by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 800-366-6530, Fax: 1-203-535-1582, Web: www.bilco.com
2. Precision Ladder, LLC
3. Architect approved equal prior to bid

B. Furnish and install where indicated on plans hatch rail system Model RL2-E. The hatch rail system shall be field assembled and installed per the manufacturer’s instructions.

C. Performance characteristics:

1. High visibility safety yellow powder coat paint finish.
2. Hatch rail system shall attach to the capflashing of the roof hatch and shall not penetrate any roofing material.
3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and shall meet OSHA strength requirements with a factor of safety of two.
4. Corrosion resistant construction with a five-year warranty.
5. Hinged gate shall ensure continuous barrier around the roof hatch.
6. Self-closing gate hinge and positive latching system provided with hatch rail system.

D. Posts and Rails: 1-1/4” (32mm) 6061 T6 schedule 40 aluminum pipe.

E. Hardware: Mounting brackets shall be 3/8” (9mm) thick extruded aluminum. Pivoting post guides with compression fittings and latching mechanism shall be cast aluminum. Self-closing hinges and all fasteners shall be type 316 stainless steel.

2.04 EXTERIOR ACCESS LADDER

A. Manufacturers:

1. Basis-of-Design Manufacturer: The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 800-366-6530, Fax: 1-203-535-1582, Web: www.bilco.com
2. Precision Ladder, LLC
3. Architect approved equal

B. Furnish and install where indicated on plans model 564 fixed wall ladder with cross-over platform and return.

C. Construction and Material

1. Material: 6061-T6 aluminum alloy
2. Treads: 1-1/8” round rungs, serrated and secured with cast aluminum connections.
3. Mounting: General contractor to coordinate and obtain approval from roofing manufacturer prior to wall mounting so as not to void warranty.
4. Cross-over platform: GripStruct® floor with 4” high toe boards.
5. Size – height: 10’-6” roof to platform, verify in field prior to fabrication. Width: 1’-8 ¼”
6. Finish: Mill

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that roof hatch installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

A. The Contractor shall check as-built conditions and ensure the installer verifies the manufacturer's roof hatch details for accuracy to fit the application prior to fabrication. The Contractor shall ensure that installer complies with the roof hatch Manufacturer's installation instructions.

B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a complete seal.

D. The Contractor shall ensure that installer furnishes mechanical fasteners consistent with the roof requirements.

E. Add pressure treated wood blocking as required to elevate roof hatch above the finished surface of the roof for proper roof flashing.

F. Test operate units. Clean and lubricate joints and hardware. Adjust for proper operation.

G. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 07 72 33

SECTION 07 84 00

FIRESTOPPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to work specified in this section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

B. Openings between structurally separate sections of wall or floors.

C. Gaps between the top of walls and ceilings or roof assemblies.

D. Expansion joints in walls and floors.

E. Openings and penetrations in fire-rated partitions or walls containing fire doors.

F. Openings around structural members which penetrate floors or walls.

1.04 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Division 3, Section “Cast-In-Place Concrete”
2. Division 7, Section “Joint Sealants”
3. Division 9, Section “Gypsum Board Assemblies”
4. Division 22, Section “Plumbing”
5. Division 23, Section “HVAC”
6. Division 26, Section “Electrical”

1.05 REFERENCES

A. Test Requirements: ASTM E 814, “Standard Method of Fire Tests of Through Penetration Fire Stops”

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems”

D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:
   a. Firestop Devices (XHJI)
   b. Fire Resistance Ratings (BXRH)
   c. Through-Penetration Firestop Systems (XHEZ)
   d. Fill, Voids, or Cavity Material (XHHW)
   e. Forming Materials (XHKU)
   f. Joint Systems (XHBN)
   g. Perimeter Fire Containment Systems (XHDG)
2. Alternate Systems: "Omega Point Laboratories Directory" (updated annually).

E. Test Requirements: ASTM E 1966, "Standard Test Method for Fire Resistive Joint Systems"

F. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"

G. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops"

H. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials"

I. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

J. International Building Code: 2012 Edition

K. NFPA 101 – Life Safety Code: 2012 Edition

L. NFPA 70 – National Electric Code: 2017 Edition

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

B. Fire stop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed fire stop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Fire stop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Contractor shall consult the Architect's Structural Engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.07 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions.

C. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in document.

D. Submit installation details for each condition and product.

1.08 INSTALLER QUALIFICATIONS

A. Contractor to engage an experienced installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 – PRODUCTS

2.01 FIRESTOPPING – GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma (Basis of Design)
   800-879-8000
   www.us.hilti.com
2. Or Architect approved equal prior to bid

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls.

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE) (Basis of Design)
2. Hilti Flexible Firestop Sealant (CP 606)
3. Or Architect approved equal.

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Flexible Firestop Sealant (CP 606) (Basis of Design)
2. Hilti Intumescent Firestop Sealant (FS-ONE)
3. Or Architect approved equal.

E. Sealants and caulking materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Hilti Flexible Firestop Sealant (CP 606) (Basis of Design)
2. Or Architect approved equal.

F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.

1. Hilti Speed Plugs (CP 777) (Basis of Design)
2. Hilti Speed Strips (CP 767)
3. Or Architect approved equal.

G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE) (Basis of Design)
2. Or Architect approved equal.

H. Intumescent sealants or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE) (Basis of Design)
2. Hilti Flexible Firestop Sealant (CP 606)
3. Or Architect approved equal.

I. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti Firestop Putty Pad (CP 617) (Basis of Design)
2. Hilti Firestop Box Insert
3. Or Architect approved equal.

J. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N) (Basis of Design)
2. Hilti Firestop Collar (CP 644)
3. Or Architect approved equal.

K. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

L. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.

PART 3 – EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector, per requirements of Section 109, International Building Code 2000, ed.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with Architect's Mechanical Engineer and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Manufacturer's Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION 07 84 00

SECTION 07 92 00

JOINT SEALANTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior sealants.
2. Exterior and interior polyurethane traffic sealants.
3. Interior sealants.
4. Interior sanitary silicone sealants.
5. Metal lap joint sealants.
6. Threshold and sheet metal bedding sealants.
7. Joint accessories.

1.2 REFERENCES

A. ASTM International Inc.
1. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
2. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
3. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
4. ASTM C834 - Standard Specification for Latex Sealants.
5. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
6. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
7. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
8. ASTM C 1311 - Standard Specification for Solvent Release Sealants.
9. ASTM D 2203 - Standard Test Method for Staining from Sealants.

1.3 SUBMITTALS

A. Shop Drawings:
1. Submit details to show installation and interface between sealants and adjacent work.

B. Product Data:
1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Samples:
1. Submit color charts for each sealant type for initial selection.
2. Submit standard cured color samples for each sealant type illustrating selected colors.

D. Test Reports:
1. Submit results of laboratory pre-construction testing.
2. Submit results of field pre-construction testing.
3. Submit manufacturer's recommendations for joint preparation, priming, and joint accessory materials based on test results.
4. Submit manufacturer's recommended installation procedure modifications resulting from field adhesion tests.

E. Manufacturer's Installation Instructions:
1. Submit manufacturer’s published installation procedures.
2. Include instructions for completing sealant intersections when different materials are joined.

F. Manufacturer's Certificate:
1. Certify products are suitable for intended use and products meet or exceed specified requirements.
2. Certify applicator is approved by manufacturer.

G. Qualifications Data:
1. Submit applicator's qualifications, including reference projects of similar scope and complexity, with current phone numbers and contact names of architects and owners for verification.

H. Manufacturer's Field Reports:
1. Indicate time present at project site.
2. Include observations, indicate compliance with manufacturer's installation instructions, and supplemental instructions provided to installers.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
1. Submit recommended inspection intervals.
2. Submit instructions for repairing and replacing failed sealant joints.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the following:
1. Building Joints: ASTM C 1193.

B. Laboratory Pre-Construction Testing:
1. Test sealants, joint accessories, and joint substrates in accordance with the following, before starting work of this section:
a. Obtain samples of joint substrate products specified in other sections.
b. Adhesion: ASTM C 794 and ASTM C 719; determine surface preparation and required primer.
c. Compatibility: ASTM C 1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
d. Staining: ASTM D 2203, ASTM C 510, or ASTM C 1248; determine sealants will not stain joint substrates.
2. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.

C. Field Pre-Construction Testing:
1. Test each elastomeric sealant and joint substrate in accordance with the following, before beginning work of this section:
a. Install sealants in mockups using joint preparation methods determined by laboratory pre-construction testing.
b. Install field-test joints in inconspicuous location as approved by Architect.
c. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
d. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

B. Applicator Qualifications:
   1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.
   2. Designate one individual as project foreman who shall be on site at all times during installation.

1.7 MOCKUP

A. Install sealants in mockups specified in other sections including sealant and joint accessories to illustrate installation quality and color.

B. Incorporate accepted mockup as part of Work.
   1. Repair seal joint mockups used for field adhesion testing.

1.8 PRE-INSTALLATION MEETINGS

A. Convene meeting minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in manufacturers unopened original packaging. Inspect for damage.

B. Store primers and sealants in cool dry location with ambient temperature range of 60 to 80 degrees F (15 to 27 degrees C).

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 degrees F (4 degrees C).

1.11 SCHEDULING

A. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.

B. Ensure sealants are cured before covering with other materials.

1.12 WARRANTY

A. Submit signed copies of the following warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of 3 years from date of completion.
   1. Manufacturer's standard warranty covering sealant materials.
   2. Applicator's standard warranty covering workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Tremco Sealant/Weatherproofing Division of RPM International, Inc. (Basis of Design)

B. Pecora Corporation (Acceptable Alternate)

C. Architect approved equal prior to bid.

2.2 URETHANE SEALANTS

A. Multi-Component Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses T, NT, M, A, and O; two component, chemical curing, nonstaining, nonbleeding, color as selected.
   1. Dymeric 240FC (Basis of Design)
   2. Architect approved equal prior to bid.

B. Multi-Component Self-Leveling Urethane: ASTM C920, Type M, Grade P, Class 25, Uses T; self leveling, multi-component, chemical curing, nonstaining, nonbleeding, color as selected.
   1. THC 900 (Basis of Design)
   2. THC 901
   3. Vulkem 45 SSL + Catalyst (water = catalyst)
   4. Architect approved equal prior to bid.

2.3 SILICONE SEALANTS

A. Multi-Component Silicone: ASTM C920, Type M, Grade NS, Class 50; Uses NT, M, G, A and O: multi-component, neutral curing, nonstaining, nonbleeding, color as selected
   1. Spectrem 4-TS (Basis of Design)
   2. Architect approved equal prior to bid.

2.4 OTHER SEALANTS

A. Latex Sealant: ASTM C 834; single component, solvent curing, nonstaining, nonbleeding, nonsagging; color as selected.
   1. Tremflex 834 (Basis of Design)
   2. Architect approved equal prior to bid.

B. Synthetic Rubber Sealant:
   1. Acoustical Sealant (Basis of Design)
   2. Architect approved equal prior to bid.

C. Butyl Sealant: ASTM C 1311, butyl or polyisobutylene, single component, nondrying, non-skinning, non-curing.
   1. Butyl Sealant (Basis of Design)
   2. Architect approved equal prior to bid.

2.5 ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

C. Joint Backing: Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking Tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.
   1. Verify joint surfaces are clean and dry.
   2. Ensure concrete surfaces are fully cured.

B. Report unsatisfactory conditions in writing to the Architect;

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.

B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
   1. Clean concrete joint surfaces to remove curing agents and form release agents.

C. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 SEALANT INSTALLATION

A. Install primer and sealants in accordance with ASTM C 1193 and manufacturer's instructions.

B. Install joint backing to maintain the following joint ratios:
   1. Joints up to 1/2 inch (13 mm) Wide: 1:1 width to depth ratio.
   2. Joints Greater than 1/2 inch (13 mm) Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.

C. Install bond breaker where joint backing is not used.

D. Apply primer where required for sealant adhesion.

E. Install sealants immediately after joint preparation.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Joining Silicone and Polyurethane Sealants:
   1. Install polyurethane sealants first.
   2. Join silicone sealant to polyurethane in accordance with manufacturer's instructions.

H. Tool exposed joint surface concave.

3.4 MANUFACTURER'S FIELD SERVICES

A. Require sealant manufacturer to be present at project site to:
   1. Observe sealant mockup installation and to issue reports of observations.
   2. Conduct field pre-construction testing.

3.5 CLEANING

A. Remove masking tape.

B. Clean adjacent surfaces soiled by sealant installation.

3.6 SCHEDULE – SEALANT JOINTS

A. Exterior Sealant Joint [Type A]:
   1. Applications:
      a. Control and expansion joints in cast-in-place concrete.
      b. Joints between architectural precast concrete units.
      c. Control and expansion joints in unit masonry.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
      f. Control and expansion joints in soffits and overhead surfaces.
      g. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
   2. Multi-Component Silicone Sealants:
      a. Spectrem 4-TS.

B. Interior Sealant Joint [Type C]:
   1. Applications:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints on exposed interior surfaces of exterior openings.
      c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
      d. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
   2. Multi Component Urethane Sealants:
      a. Dymeric 240/240FC.

C. Traffic Sealant Joint [Type D]:
   1. Applications:
      a. Control, expansion and isolation joints in cast-in-place concrete.
      b. Tile control and expansion joints.
      c. Joints between different materials listed above.
      d. Other interior and exterior traffic bearing joints in horizontal and sloped traffic surfaces
   2. Multi Component Urethane Sealants:
      a. THC-900/901, self-leveling.

D. Interior Sanitary Sealant Joint [Type G]:
   1. Applications:
      a. Joints in toilet room and bathroom counter tops.
      b. Joints between plumbing fixtures and adjacent materials.
      c. Other interior joints in wet areas where needed to limit mold and mildew growth.
   2. Single Component Silicone Sealants:
      a. Tremsil 200.

E. Concealed Metal Lap Sealant Joint [Type J]:
   1. Applications:
      a. Concealed lap and hook joints in sheet metal flashing and trim.

2. Single Component Non-Curing Sealants:
    a. Tremco Butyl Sealant.
    b. Tremco Acoustical Sealant.

F. Concealed Bedding Sealant Joint [Type K]:
1. Applications:
    a. Bedding joints under metal thresholds and saddles.
    b. Bedding joints between sheet metal flashing and other materials.
2. Single Component Non-Curing Sealants:
    a. Tremco Butyl Sealant.

END OF SECTION 07 92 00

SECTION 08 11 00

HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes steel doors and frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8, Section "Finish Hardware" for door hardware and weatherstripping.
2. Division 8, Section "Glazing" for glass in steel doors and sidelights.
3. Division 9, Section "Painting" for field painting primed doors and frames.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Steel door and frame submittal to be completed only after pre-submittal meeting has taken place between Contractor, Owner, Architect, hollow metal frame supplier, hardware supplier, wood door supplier, and glazing supplier.

C. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

D. Provide Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

E. Door Schedule: Submit schedule of doors and frames using same reference numbers and format for details and openings as those on Contract Drawings.

1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.04 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Provide doors and frames and related components from one manufacturer for each type of door and frame.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking or pallets. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Doors and Frames:
   a. Ceco Door Products.
   b. Curries Co.
   c. Mesker Industries, Inc.
   d. Steelcraft Manufacturing Co.
   e. Pioneer Industries
   f. Republic Steel Corp.
   g. Premier Steel Doors and Frames
   h. Amweld Building Products, Inc.

2.02 DOORS

A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:

1. Interior Doors: Grade III, extra heavy-duty, Model 2, seamless design, minimum 0.0598-inch-(1.5-mm-)-(16ga) thick cold-rolled steel sheet faces.
2. Exterior Doors: Grade III, extra heavy-duty, Model 2A, seamless design, minimum 0.0785-inch- (2.0-mm-)-(14ga) thick galvanized steel sheet faces.

2.03 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated.

1. Fabricate frames with mitered or coped corners, continuously face welded construction for exterior and interior applications.
2. Fabricate frames for interior openings from 0.0598-inch- (1.5-mm-) thick steel sheet.

3. Fabricate frames for secure interior openings from 0.0785-inch- (2.0-mm-) thick galvanized steel sheet.
4. Form exterior frames from 0.0785-inch- (2.0-mm-) thick galvanized steel sheet.
5. **Knockdown frames are not acceptable for this Project.**

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

D. **Grout: All exterior hollow metal door and window frames shall be fully grouted.**

2.04 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
   a. Vertical steel stiffeners.
   b. Honeycomb
   c. Polystyrene
2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.
   a. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

F. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

G. Hardware Preparation: Prepare doors and frames to receive hardware indicated in Division 8 Section “Finish Hardware” according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.

H. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

I. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

J. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

2.6 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pre-treatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pre-treatment.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry removable yoke.
2. Install fire-rated frames according to NFPA 80. **Do not paint over UL labels.**

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

1. Fire-Rated Doors: Install with clearances specified in NFPA 80. **Do not paint over UL labels.**

3.02 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 00

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Solid core doors with wood veneer faces.
2. Factory finishing of flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section “Steel Doors and Frames”
2. Division 8 Section “Finish Hardware”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. **Wood door submittal to be completed only after pre-submittal meeting has taken place between Contractor, Owner, Architect, hollow metal frame supplier, hardware supplier, wood door supplier, and glazing supplier**.

C. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

D. Shop Drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.

1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts such as lite openings and security wire ways.

E. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:

1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.

F. Samples for verification in the form and size indicated below:

1. Corner sections of doors approximately 12 inches (300 mm) square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

1.04 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

B. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer including non-rated and rated doors.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Each door shall be wrapped for protection during delivery and remain on the door once they are installed.

C. Identify each door with individual opening numbers as designated on shop Drawings, using temporary, removable, or concealed markings.

1.06 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:

1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.07 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, Contractor’s Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.

1 Warranty shall be in effect during the following period of time after date of Substantial Completion.

a. Solid Core Interior Doors: Life of installation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:

1. Solid Core Doors:
   a. Masonite Architectural (Basis of Design)
   b. Osh Kosh Corporation.
   c. VT Industries

2.02 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors:

1. Faces: White Oak, plain sliced select.
2. Grade: Custom.
3. Construction: 5 plies, hot pressed.
4. Core: Particleboard core.
5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
6. Finish: Clear.

2.03 VENEER MATCHING

A. Within Door Faces: Provide doors with the following veneer matching:

1. Book & running matched.

B. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.

2.04 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:

1. In sizes indicated for job-site fitting.
   a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop Drawings, DHI A115-W series standards, and hardware templates.
   a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required in the factory.

1. Lites: Factory install metal window trim **(no wood trim)** in prepared openings for field installed glazing.

2.05 FACTORY FINISHING

A. General: Comply with referenced quality standard's requirements for factory finishing.

B. Finish wood doors at factory using WDMA TR-8/AWS System 9, catalyzed polyurethane.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.

1. Grade: Premium.
2. Finish: Clear
3. Sheen: Satin.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects or damage.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation see Division 8 "Finish Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining to match door color and finish.

1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4-mm) clearance from bottom of door to top of threshold.
2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
4. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim bottom and rails only to extent permitted by labeling agency; 3/4” maximum.

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

3.03 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors damaged during installation in excess of surface blemishes as required by the Architect.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 16

SECTION 08 33 23

SECTIONAL OVERHEAD DOORS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Glazed Aluminum Sectional Overhead Doors

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.02 RELATED SECTIONS

A. Division 3, Section “Cast-In-Place Concrete”. Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Division 7, Section “Joint Sealants”. Perimeter sealant and backup materials.

C. Division 9, Section “Painting”. Field painting.

1.03 REFERENCES

A. ANSI/DASMA 102 – American National Standard Specifications for Sectional Overhead Type Doors.

1.04 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

B. Wiring Connections: Requirements for electrical characteristics.

1. 208 volts, three phase, 60 Hz.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five (5) years documented experience.

B. Contractor's Installer Qualifications: Authorized representative of the manufacturer with minimum five (5) years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.08 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

A. Pre-Approved Alternate Manufacturers:
1. Clopay Building Products
2. C.H.I. Overhead Doors
3. Architect approved equal prior to bid.

2.02 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
   a. Panel Thickness: 1-3/4 inches (44 mm).
   b. Center Stile Width: 2-11/16 inches (68 mm)
   c. End Stile Width: 3-5/16 inches (84 mm)
   d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
   e. Top Rail Width: 3-3/4 inches (95mm)
   f. Bottom Rail Width: 4 ½ inches (144mm)
   g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
   h. Stiles and Rails: 6063 - T6 aluminum.
   i. Springs: 100,000 cycles
   j. Glazing: 1/2 inch (12.5 mm) Solar Gray Insulated glazing.
2. Finish and Color:
   a. Powder Coating Finish: Tiger Drylac – Color to be selected by Architect from full range.

3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock: Interior galvanized single unit.
6. Weatherstripping:
   a. Flexible bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   a. Provide manufacturer's standard galvanized steel tracks and accessories designed to accommodate door size, weight, and clearances indicated from adjacent construction. Provide brackets and reinforcing for rigid support of roller guides, for door type and size. Fabricate vertical track sections with slots for door drop safety device at 2 inches on center. Tilt tracks from vertical to achieve closure at jambs when sectional door is closed. Weld or bolt to track supports.
   b. Support tracks with manufacturer's standard anchors and brackets for size and weight of door, to provide strength and rigidity, and smooth and continuous operation. Provide continuous angle anchored to wall and welded to track in accordance with manufacturer's instructions. Provide continuous angle welded to horizontal tracks and braced laterally to overhead structural members at each end of tracks.
8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. RHX Trolley Type 3/4 horse power motor.
   b. Entrapment Protection: Required for momentary contact, includes radio control operation.
      1) Photoelectric sensors mounted at 6” A.F.F. monitored to meet UL 325/2010.
      2) Provide safety sensor on the bottom of doors.
   c. Operator Controls:
      1) Push-button operated control stations with open, close, and stop buttons.
      2) Flush mounting.
      3) Interior location.
   d. Special Operation:
      1) Radio control operation.
      2) 6’ long light curtain sensors mounted so the top of the sensor is at 8’-0” AFF.
      3) Exhaust Control Input: Folding doors shall be tied into apparatus bay exhaust system so exhaust systems shall commence operation upon opening of doors. Contractor shall coordinate the controls required to ensure this operation between HVAC subcontractor and door subcontractor.
      4) Doors shall be equipped with pull and hold release for manual door opening in the event power is lost. A pull and hold type mechanism with single cable operation and an integrated interlock switch on hoist units.
         (a) Release shall consist of a manual disconnect door arm on trolley units.
      5) Hoist: Chain hoist consists of chain pocket wheel, chain guard and smooth hand chain on hoist units.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.

3.03 INSTALLATION

A. Install overhead doors and track in accordance with approved shop Drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service to ensure that doors are fully operational. Complete power and control wiring from disconnect to unit components.

3.04 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weather-stripping.

B. lean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.05 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of Project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION 08 33 23

SECTION 08 35 13

FOUR-FOLD DOOR SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Four-Fold metal doors with surface mounted tube frames.

B. Operation of Four-Fold metal doors includes overhead mounted electro-mechanical operators.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.

C. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.

D. Reference list including (5) successful installations of this type of door within the past two (2) years.

1.4 QUALITY ASSURANCE

A. Doors shall be designed to withstand external or internal horizontal wind loads of **(25)** pounds minimum per square foot. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual".

B. Door manufacturer shall have at least 10 years experience in manufacturing door type specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.

B. Handle materials carefully to prevent damage.

1.6 WARRANTY

A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Four-Fold industrial metal doors manufactured by Door Engineering and Manufacturing, 400 Cherry Street, Kasota, MN 56050, (800)-959-1352 or equal products by other manufacturers approved in advance.

FF300 Series: Glazed

2.2 MATERIALS

A. Steel Tube: ASTM A513 and ASTM A500/A500M

B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011/A1011M hot-rolled steel sheet.

C. Hardware: Manufacturer's standard components.

D. Fasteners: Zinc-coated steel.

2.3 FOUR-FOLD DOORS

A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 14-gauge steel sheet on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x0.25, designed to anchor to concrete wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.

C. Factory Finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat. Customer to select from Manufacturer's standard color chart or furnish sample to match.

1. Operator and operating hardware shall be powder-coated manufacturer's standard gray.

D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.

1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.
2. Doors up to 16' wide and under 30psf wind load shall require no floor mounted supports, guides or tracks.
3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.

E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum ¾" diameter hardened steel.

F. Hinge Guards: Provide plastic guards at jamb hinges to prevent access through hinge space.

G. Weather-stripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weather-stripping at center shall be 1/16" cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel. Weather-stripping at sill shall include two 1/16" cloth inserted neoprene sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

H. Perimeter Weather-stripping: Provide jamb and head weather-stripping of 1/16" cloth-inserted neoprene bulb (or closed cell neoprene).

I. Vision Panels: Provide 1" insulated, tempered, solar grey tinted vision panels of the size, shape and location as noted on the drawings.

2.4 OPERATOR

A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.

B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.

C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.

D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. **Incoming electrical shall be 208/230VAC 3-phase.**

1. Control panel assemblies shall be UL listed as per NFPA70.
2. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/ outputs.
3. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.
4. Enclosures shall be NEMA 4 with disconnect switch.
5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.
6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.

7. Safety Edges: Provide 4-wire fail-safe electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
8. Photo Eyes: Provide (1) exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72" above floor.
9. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor with pre-open and pre-close safety fields. Sensor shall be LZR-Widescan or equal.
10. Radio Controls: Provide two (2) radio receivers and (2) single button remotes per door. Remotes to open and close doors with single button.
11. Exhaust Control Input: Folding doors shall be tied into apparatus bay exhaust system so exhaust systems shall commence operation upon opening of doors. Contractor shall coordinate the controls required to ensure this operation between HVAC subcontractor and door subcontractor.
12. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.2 ADJUSTING AND CLEANING

A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION 08 35 13

SECTION 08 41 00

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers complete entrances, storefront, curtain wall and sun shade systems. Supplying of fastenings, connections to building structure, and other items not mentioned specifically herein, but which are necessary to make a complete installation shall also be included.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. Division 7, Section “Joint Sealants”
2. Division 8, Section “Glazing”
3. Division 8, Section “Finish Hardware”

1.02 QUALITY ASSURANCE

A. System Performance. Provide exterior entrances, storefront and curtain wall assemblies that have been designed and fabricated to comply with system performance characteristics listed below as demonstrated by testing systems according to test methods designated.

1. Wind Loading. Provide capacity to withstand loading noted on Structural Drawings, tested in accordance with ASTM E 330-90.

B. Transmission characteristics of fixed framing shall comply with requirements indicated below.

1. Air infiltration shall be not more than 0.03 CMF per square foot (0.0003 cubic meters per hour per square meter) of fixed area in accordance with ASTM E 283.
2. No uncontrolled water penetration shall occur at pressure differential of 6.24 psf (299 Pa) in accordance with ASTM E 331-93 (excluding operable door edges).
3. Condensation resistance shall be not less than 63 CRF in accordance with AAMA 1502.7.
4. Thermal transmittance shall provide U-value of no more than 0.45 Btu/hr/sf/degree F (0.12 Watts/square meter/degree Kelvin) in accordance with AAMA 1503.1 and NFRC 102.

C. Transmission characteristics of entrances (doors with jamb and head frames) shall comply with requirements indicated below.

1. Air infiltration per linear foot (0.3 meters) of perimeter crack shall be not more than 0.43 CFM (2.44 cubic meters per hour) of crack length for single doors and .50 CFM (2.83 cubic meters per hour) of crack length for pairs of doors at pressure differential of 1.567 psf (75 Pa) in accordance with ASTM E 283-91.
2. Structural: Door corner structural strength shall be tested per manufacturer’s dual moment test procedure and certified by an independent testing laboratory to ensure corner integrity and weld compliance. Certified test procedures and results are available upon request.
3. Structural Uniform Load Test:
   a. Single Doors: +91/-104 psf.
   b. Pair of Doors: +45/-45 psf.
4. Forced Entry Resistance: 300 lbs. satisfactory.

D. Design Criteria.

1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage, or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
3. Provide concealed fastening.
4. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
6. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
7. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.

D. Qualifications.

1. Contractor’s Installer Qualifications: Engage a firm who can provide evidence to indicate successful experience in the installation of work specified herein.
   a. Manufacturer Acceptance: Contractor’s installer shall be acceptable to the material manufacturer and shall provide a letter certifying the approval of the material manufacturer.
   b. Contractor’s installer shall be one who maintains a complete staff of trained mechanics and supervisors sufficient to perform work of this section.

E. Mock-Up (Field Constructed).

1. Install at Project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.
2. Mock-Up Size: 12”x12” to be installed into masonry mock-up and including glazing and perimeter joint sealants.
3. Maintain mock-up during the construction duration for workmanship comparison, remove and legally dispose of materials once Architect directs removal.

F. Pre-Installation Meetings: Conduct pre-installation meeting to verify Project requirements, substrate conditions, manufacturer’s installation instructions, and manufacturer warranty requirements. All measurements shall be field verified prior to fabrication of windows units.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Manufacturer's Product Data:

1. Specifications and Instructions. Submit material specifications and installation instructions for products specified under PART 2 - PRODUCTS.
   a. Modifications. Modify submission by letter form to reflect Project requirements and job conditions.
   b. Storage and Handling Instructions: Include instructions for storage, handling and

protection of products.

c. Contractor's Installer Copy. Indicate by transmittal form that copies of modified (if any) specifications and instructions have been distributed to Contractor's installer.

2. Supplementary Installation Instructions: Retain at job site manufacturer's supplementary installation instructions for products specified under PART 2 - PRODUCTS. Maintain and make available installation instructions retained at job site.

C. Shop Drawings.

1. General. Submit shop Drawings stamped and signed by a Structural Engineer registered in the State of Georgia for fabrication and erection.
   a. Include Project specific plans and elevations at not less than ½" to 1'-0" scale, and details at not less than 3" to 1'-0" scale.
   b. Indicate required anchorage size, type, spacing, embedment, accessory items, and finishes.
2. Detailing. Include details of metal sections showing thickness, contraction and expansion joints; methods of control of water leakage and condensate; details of methods and procedures for erection and glazing.

D. Samples.

1. Submit two (2) samples of the proposed finish specified herein.

E. Warranty. Provide written sample warranty signed by Manufacturer, Contractor's Installer, and Contractor, agreeing to replace aluminum storefronts which fail in materials or workmanship within three years of Substantial Completion. Failure of materials or workmanship includes excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal wear, and deflects in hardware and other components of the work.

F. Maintenance Manual. Submit maintenance manual, with instructions for cleaning, sealant/gasket repair and glass replacement.

G. Calculations. Submit calculations stamped and signed by a Structural Engineer registered in the State of Georgia, for information, confirming, and approval that specified structural requirements and wind loading are met. Include code basis.

H. Certification. Submit certificates of compliance with the following tests.

1. Water Infiltration: ASTM E 331 at static pressure of 15PSF or AAMA 501.1 at a dynamic pressure of 15PSF, no penetration.
2. Air Infiltration: ASTM E 283, 0.06 cfm maximum infiltration.
3. Uniform Load Test. ASTM E 330, not to exceed L/175 when tested at positive and negative loads as prescribed by Code.

I. Shop drawings and calculations shall be submitted to the City Development Department for approval after approval by the Structural Engineer of Record.

1.04 JOB CONDITIONS

A. Coordination. Coordination of work of this section with that of other building trades is mandatory with particular attention being given to work in those areas where other materials by other trades are adjacent to and connected to aluminum storefront systems.

1.05 WARRANTY

A. Project Warranty: Refer to Specification Section 01 78 40.

B. Manufacturer's Warranty: Submit, for Architect's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

1. Beneficiary: Issue warranty in the legal name of the Project Owner.
2. Warranty Period: 5 years (minimum) commencing from the Date of Substantial Completion.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations. Any damage to the storefront material or finishes shall be replaced at the Contractor's expense.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements indicated, provide products by one of the following:

1. **Oldcastle BuildingEnvelope®, Terrell, TX (Basis of Design)**
2. YKK Corporation.
3. Kawneer Company

B. Substitutions: Submit under provisions of Section 01 63 00.

C. Acceptable Storefront Framing System:

1. Series 6000 Thermal MultiPlane, glass set to the center, thermally broken, exterior or interior loaded 2" x 6" mullion profile. This system uses a poured-in-place polyurethane thermal pocket to create its thermal break. This system accommodates 1" glass thickness, with 1/4" as an option.

[SSG – Structural Silicone Glazed Mullion]

D. Acceptable Storefront Entrance System:

PerforMax Series 500 Door (5" wide stile, 1 3/4" thick) heavy duty entrance system with 1" insulated glazing.

1. Fabrication:
   a. Stiles: Minimum 5" x 1-3/4", irrespective of glazing stop.
   b. Top Rail: Minimum 6" x 1-3/4", irrespective of glazing stop.
   c. Center Rail: Minimum 6" x 1-3/4", irrespective of glazing stop.
   d. Bottom Rail: Minimum 12" x 1-3/4", irrespective of glazing stop.
   e. Wall Thickness: 1/8" (0.125 inch) minimum actual thickness.

2. Door Hardware:
   a. Hinges: Heavy duty extruded aluminum continuous gear hinges
   b. Closers: Refer to Division 07 – Finish Hardware..
   c. Exit Device: Heavy duty commercial exit device.
      1. Grade 1
      2. UL Listed for accident hazard and fire exit hardware
      3. Roller strike
      4. Latch Bolt Deadlocking
      5. Non-handed
      6. Field Sizeable
      7. Minimum 3/4-inch Throw Latch Bolt
      8. Touch pad in dogged position shall not extend beyond end cap assembly.
      9. End cap assembly shall not protrude beyond face.
      10. Lever Style: Von Duprin No. 17.
      11. Dogging: Dogging feature by keyed cylinder.
   d. Door Stops: Refer to Division 07 – Finish Hardware.
   e. Door Trim: Refer to Division 07 – Finish Hardware.
   f. Threshold: Extruded aluminum, grooved top, minimum thickness 1/8-inch, saddle type, 5 inches wide, 1/2-inch high, mill finish

2.02 FRAMING MATERIALS AND ACCESSORIES

A. Aluminum:
   1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

B. Internal Reinforcing:
   1. ASTM A36 for carbon steel.
   2. Shapes and sizes to suit installation.
   3. Steel components factory coated with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:
   1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
   2. Hot-dip galvanize steel assemblies after fabrication; comply with ASTM A123, 2.0 ounce minimum coating.

D. Fasteners:
   1. Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.
   2. Provide concealed fasteners wherever possible.
   3. For exposed locations, provide Phillips flathead screws with finish matching item fastened.
   4. For concealed locations, provide manufacturer's standard fasteners.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Touch-Up Primer for Galvanized Components: Zinc oxide conforming with FS TT-P-641.

H. Glazing Gaskets:
1. Compression type design, replaceable, molded or extruded, of neoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
2. Profile and hardness as required to maintain uniform pressure for watertight seal.

I. Weatherstripping:
1. Wool pile conforming to AAMA 701.2.
2. Provide EPDM or vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

J. Internal Sealants and Baffles.

2.03 GLASS AND GLAZING ACCESSORIES

A. Refer to Section 08 80 00.

2.04 FABRICATION

A. Coordination of Fabrication:
1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
2. Fabricate units to withstand loads that will be applied when system is in place.

B. General:
1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements, and for support to structure.
3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
4. Comply with Section 08 80 00 for glazing requirements.

C. Aluminum Framing:
1. Provide members of size, shape and profile indicated, designed to provide for glazing from exterior.
2. Provide manufacturer's standard thermal break between exterior and interior aluminum surfaces.
3. Fabricate frame assemblies with joints straight and tight fitting.
4. Reinforce internally with structural members as necessary to support design loads.
5. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
6. Seal horizontals and direct moisture accumulation to exterior.
7. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
8. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.

D. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

E. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.05 FINISHES

A. Organic Coating (high performance fluorocarbon):
1. Comply with requirements of AAMA 2605.
2. Surfaces cleaned and given conversion coating pre-treatment prior to application of 0.3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.
3. Finish coat of 70% minimum fluorocarbon resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil minimum dry film thickness.
4. Acceptable coatings are Trinar by Akzo Coatings, Inc.; Nubelar by Glidden Company; Fluoroceram by Morton International, Inc.; Duranar by PPG Industries Inc.; and Fluropon by Valspar Corporation.
5. Provide in either a 2, 3, or 4 coat system as required for color selected.
6. Custom colors as selected by Architect.

2.06 GLAZING

A. Glazing: Comply with Division 08, Section 'Glazing'.

B. Glazing Gaskets: Manufacturer's standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks and shims or spacers.

C. Glazing Sealants: As required by the Manufacturer.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS/RECOMMENDATIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Provide separation between aluminum surfaces and sources of corrosion or electrolytic action, such as copper or untreated steel, by coating area of dissimilar metals with heavy-bodied bituminous paint.

B. Paint aluminum surfaces in contact with lime mortar or concrete with alkali-resistant coating.

C. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.04 INSTALLATION

A. Installation shall be in accordance with requirements of manufacturer and as shown on Drawings.

1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Shim and brace aluminum system before anchoring to structure.
5. Provide sill flashing at exterior storefront and curtain wall systems. Extend extruded flashing continuous with splice joints; set in continuous beads of sealant.
6. Verify storefront and curtain wall systems allow water entering system to be collected in gutters and wept to exterior. Verify metal joints are sealed in accordance with manufacturers installation instructions.
7. Locate expansion mullions where indicated on reviewed shop Drawings.
8. Seal metal to metal storefront and curtain wall system joints using sealant recommended by system manufacturer.
9. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

B. Erection Tolerances: Install glazed storefront and curtain wall systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

B. Field Test: Conduct field test to determine water-tightness of storefront and curtain wall systems. Conduct test in accordance with AAMA 501.3-94 for water spray test, ASTM E 1105 for water penetration and ASTM E 783 for air infiltration at locations selected by Architect.

1. Perform minimum of three (3) tests each. Perform test in Architect's presence.

C. Units will be considered defective if they not pass tests and inspections, Contractor shall make required repairs and corrections at no expense of the Owner.

D. Prepare test and inspection reports and provide to the Architect within 10 days of testing.

3.05 ADJUSTMENT AND CLEANING

A. Make necessary adjustments to attain normal operation of each door and its mechanical hardware.

B. Clean and leave free from imperfections items provided with final finish. Remove protective coating when completion of construction activities no longer requires its retention.

C. Protection. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering.

1. Metal work to be exposed in the finished wall shall be adequately protected during all phases of the work, to prevent damage by scratches, stains, discoloration or other causes. Damage to metal or glass surfaces during fabrication, handling, shipment, or erection shall be remedied without additional cost.

END OF SECTION 08 41 00

SECTION 08 71 00

FINISH HARDWARE

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Furnishing hardware for interior doors, exterior doors.

1.02 RELATED WORK

A. Division 8 Section “Hollow Metal Doors and Frames”

B. Division 8 Section “Flush Wood Doors”

1.03 QUALITY ASSURANCE

A. The company furnishing hardware under this Section shall be regularly engaged in the sale and distribution of Finish Hardware for commercial projects.

B. The person responsible for scheduling, detailing, ordering and coordinating hardware for this Project shall be an experienced hardware consultant. Consultant membership in the Door and Hardware Institute is acceptable as indication of required experience.

C. Hardware furnished shall comply with the requirements of the Standards and Codes listedin Article 1.04 References of this Section.

1.04 REFERENCES

A. Standards:
1. BHMA 1301 – Materials and Finishes.
2. ANSI A117.1 – Specification for Making Buildings and Facilities Accessible toand Usable by Physically Handicapped People
3. ADA Accessibility Guidelines for Buildings and Facilities

B. Codes:
1. NFPA 101 Life Safety Code, 2012 Edition
2. International Building Code, 2012 Edition

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Within 30 days of Notice to Proceed, submit to the Architect for review a complete vertical format hardware specification in accordance with these Specifications. Furnish six (6) copies of complete submittal.

C. Submittal shall include manufacturer's name, type, finish and location for each item. Title page shall indicate Project, Architect, Owner, and Contractor and shall include address and phone number of each. There shall also be included a table of contents, glossary of terms, abbreviations, and symbols used in the Hardware Schedule. Also include a cross reference of all product numbers used within the Schedule that deviate from those specified. Column 1 shall state specified item and manufacturer and Column 2 shall stateprior approved substitute item and its manufacturer.

D. On doors of different sizes or where hinges, closers, or locks are different, a separate heading shall be used. No labeled openings shall be combined with non-labeled openings.Note each Specification Hardware Set in each schedule heading.

E. Submit a sample of each item of hardware that differs from the Specification. If requested, supply a sample of each hardware item required, to be retained by the Architect for comparison with the hardware furnished on the Project. Samples will be returned in time for identification

F. Furnish as part of the submittal six (6) copies of catalog cuts of all products.

G. After approval of hardware schedule, furnish templates to other trades who have hardware applied to their products. All templates shall be clearly marked as to their respective heading number and shall give full information with regard to installation, fasteners, dimensions and other pertinent details affecting their installation and operation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Hardware shall be delivered to the Project site in the manufacturers' original packages. Each item shall be clearly marked with the opening number and hardware heading to identify correct location.

B. Locked storage space complete with shelving, for unpacked crates and sorting out hardware shall be furnished. The space shall be maintained clean and dry for protection ofhardware.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate hardware with related trades.

B. Hardware shall be ordered so that it will be available on time for Project requirements.

1.08 WARRANTY

A. All hardware items shall be guaranteed for a period of one (1) year from final acceptance, with exception of door closers, which shall carry a twenty-five (25) year warranty, locksets which shall carry a limited lifetime warranty, and exit devices which shall carry athree (3) year warranty.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. A Specified Manufacturer is shown for each hardware item to establish a standard of quality and minimum functional requirements. The product numbers of these manufacturers are found in the Hardware Sets.

B. Approved manufacturers designate manufacturers whose products may be acceptable on the Project if in the opinion of the Architect the products meet the intent of the specification in terms of design, function, material, and quality of workmanship.

C. All items of a particular hardware category; i.e., locksets, closers, hinges; shall be of the same manufacturer.

D. Hinges:
1. Specified Manufacturer – PBB*
2. Approved Manufacturers – Stanley, McKinney
3. All ball bearing hinges shall be equipped with non-rising pins. Furnish non-removable pins on all out-swing exterior doors. Size hinges in accordance with specified manufacturer's published recommendations.

E. Locksets, Latches, Deadbolts:
1. Specified Manufacturer – INOX CL Series, 7 lever*
2. Approved Manufacturers – Best 9K Series, Schlage ND Series
3. Cylinderical Locksets and Latchsets: as scheduled.
   a. Chassis: cylindrical design, heavy duty zinc diecast, chromated coldrolled steel.
   b. Latchbolt: 9/16”-inch throw.
   c. Lever Trim: accessible design, solid zinc diecast.
   d. Strikes: stainless steel or wrought brass; ASA Standard.
   e. Certifications:
      1) ANSI A156.2-2011, Grades 1.
      2) UL Listed for A label single doors up 4 ft x 8 ft.

F. Door Closers:
1. Specified Manufacturer – INOX, DC90 Series*
2. Approved Manufacturers – LCN 4040 Series, Sargent 280 Series
3. Door closers shall be fully adjustable for accessibility requirements.
4. Door closers shall be overhead type and have fully hydraulic, full rack andpinion action with a high strength cast iron cylinder.
5. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment.

G. Pushes, Pulls, Stops, Trim, Flush Bolts, Track Hardware:
1. Specified Manufacturer – Burns* KN Crowder* INOX*
2. Approved Manufacturers – Hiawatha, Trimco
3. Kick plates, mop plates, and armor plates shall be furnished 10", 4", and 36" high respectively, and 2" less than door width when applied to the push side of the door and 1" less than door width when applied to the pull side of the door or to pairs of doors.

H. Weatherstrip, Thresholds, Soundseal, Fingerguards:

1. Specified Manufacturer – National Guard Products*
2. Approved Manufacturers – Reese, Zero

I. Silencers:
1. Specified Manufacturer – Burns*
2. Approved Manufacturers – Deutscher, Ives
3. Supply three (3) silencers for single opening and two (2) silencers for double openings.

J. Security Hardware:
1. Specified manufacturers – Security Door Controls* INOX*
2. Approved manufacturers – Von Duprin.

2.02 KEYING

A. Match City of Forest Park Fire Department's standard system. Review all keying requirements with the Owner during submittal process.

B. The Contractor is to provide temporary cores for the locks.

C. Permanent cores should be installed after keying review meeting with user.

D. All locksets shall be subject to a Construction Master Key System during the construction period. A total of six (6) construction master keys shall be furnished. Construction Master Key System shall be voided at the Project completion at the direction of the Owner.

E. Supply key requirements as follows: Three (3) Master keys and (2) Change keys for eachlock cylinder.

F. Final keying requirements shall be coordinated with the Owner.

2.03 MATERIAL AND FINISHES

A. Unless otherwise shown in the Hardware Sets finishes shall be as follows:
1. Hinges-Exterior Metal Doors – 630 (US32D) Satin Stainless
2. Hinges-Interior Doors – 626 (US26D) Satin Chrome
3. Continuous Hinges – Anodized Aluminum
4. Locksets – 626 (US26D) Satin Chrome
5. Door Closers – Match adjacent hardware
6. Door Trim – 630 (US32D) or 626 (US26D) Satin Stainless or Satin Chrome

PART 3 – EXECUTION

3.01 INSPECTION

A. Condition of opening size shall be verified as door frames being plumb and of correct tolerance to receive doors and hardware.

B. Examine doors, frames and hardware for damage, defects and suitability for indicated use.

C. Restore parts or items found damaged, defective, or inadequate and replace with specifiedmaterial before installation.

3.02 INSTALLATION

A. All Hardware shall be installed by carpenter mechanics, skilled in the application of institutional grade hardware.

B. Mount all hardware in accordance with DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" and the Americans with Disabilities Act.

C. Include a schedule of mounting heights for all items of hardware shall be included in Hardware Schedule for approval.

D. Include degree of opening for doors with overhead holders, closers, etc., shall be includedin Hardware Schedule for approval.

E. Show handing information in the Hardware Schedule.

F. Thresholds: Install in one continuous piece, full width of openings. Set in full bed of sealant and fasten with countersunk anchors at 6" on center.

3.03 ADJUSTING

A. All hardware shall be adjusted for correct operation. Make sure operating parts move freely and smoothly without binding, sticking or excessive clearance.

B. Coordinate with Specification Section 01 77 00 Contract Closeout.

C. After installation of hardware and before the building is accepted, inspect the installation and certify that the hardware is correctly installed in accordance with the manufacturers' recommendations.

D. After installation of all hardware and before acceptance of the building, check each locked door against key schedule to make certain that correct locks and cylinders are on proper doors. For any incorrectly located cylinder, tag and have relocated to proper location.

E. When requested, convert the construction key system to the regular key system. This shallmake construction keys inoperative.

F. Protection: Hardware shall be protected against field painting, finishing, cleaning and all other related work performed at the Project site.

3.04 HARDWARE SETS

HEADING #A1

DOORS #: 100

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL11HD
1	PUSH/PULL SET	M422 x M39D x TYPE 5/9 MTG.
1	CLOSER	DC9016HCUSH x PLATES AS REQ.
1	THRESHOLD	513
1	SET DOOR SEALS	BY FRAME MANUFACTURER
1	DOOR BOTTOM SEAL	BY DOOR MANUFACTURER

NOTE: FINISH TO MATCH DOOR/FRAME.

HEADING #A2

DOORS #: 101

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL11HD
1	LOCKSET	AR4910 x 4591
1	CYLINDER	TO MATCH NEW SYSTEM
1	ELECTRIC STRIKE	55ABC
1	ACCESS CONTROL CARD READER	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	PUSH/PULL SET	M422 x M39D x TYPE 5/9 MTG.
1	CLOSER	DC9016HCUSH x PLATES AS REQ.

NOTE: FINISH TO MATCH DOOR/FRAME. COORDINATE SECURITY HARDWAREWITH SECURITY AND ELECTRICAL SYSTEMS. ENSURE ELECTRIC STRIKE FUNCTIONS PROPERLY WITH AL FRAME.

HEADING #A3

DOORS #: 107, 146

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL11HD
1	LOCKSET	AR4910 x 4591
1	CYLINDER	TO MATCH NEW SYSTEM
1	ELECTRIC STRIKE	55ABC
1	ACCESS CONTROL CARD READER	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	PUSH/PULL SET	M422 x M39D x TYPE 5/9 MTG.
1	CLOSER	DC9016HCUSH x PLATES AS REQ.
1	THRESHOLD	513
1	SET DOOR SEALS	BY FRAME MANUFACTURER
1	DOOR BOTTOM SEAL	BY DOOR MANUFACTURER

NOTE: FINISH TO MATCH DOOR/FRAME. COORDINATE SECURITY HARDWAREWITH SECURITY AND ELECTRICAL SYSTEMS. ENSURE ELECTRIC STRIKE FUNCTIONS PROPERLY WITH AL FRAME.

HEADING #A4

DOORS #: 116B

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL11HD
1	LOCKSET	AR4910 x 4591
1	CLOSER	DC9016HCUSH x PLATES AS REQ.
1	THRESHOLD	425E
1	SET DOOR SEALS	BY FRAME MANUFACTURER
1	DOOR BOTTOM SEAL	BY DOOR MANUFACTURER

NOTE: FINISH TO MATCH DOOR/FRAME.

HEADING #A5

DOORS #: 157

EACH DOOR TO HAVE:

2	CONTINUOUS HINGES	SL11HD
1	SET FLUSHBOLTS	590 x 545 (INACTIVE)
1	DEADLOCK	AR1850S x 4066 (ACTIVE)
1	CYLINDER	TO MATCH NEW SYSTEM
2	PUSH/PULL SETS	M422 x M39D x TYPE 5/9 MTG.
2	CLOSERS	DC9016HCUSH x PLATES AS REQ.
1	THRESHOLD	425E
1	SET DOOR SEALS	BY FRAME MANUFACTURER
1	DOOR BOTTOM SEAL	BY DOOR MANUFACTURER
1	ASTRAGAL SET	BY DOOR MANUFACTURER

NOTE: FINISH TO MATCH DOOR/FRAME.

HEADING #1

DOOR #: 102A, 104B, 106, 117, 147A, 148, 156

EACH DOOR TO HAVE:

3	HINGES	4B81
1	LOCKSET-STOREROOM	CL80
1	ELECTRIC STRIKE	55ABC
1	ACCCESS CONTROL	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	MOTION SENSOR	MD31D-W
1	CLOSER	C9016CUSH
1	CLOSER	C9016 x RAHO (@ 117 ONLY)
1	KICK PLATE	KP50 x B4E x CSK
1	DOOR STOP	565/522 (AS REQUIRED @ 117)
1	SET DOOR SEALS	5050 (@ 102A, 104B, 106, 147A)
1	DOOR BOTTOM SEAL	200N (@ 102A, 104B, 106, 147A)

NOTE: COORDINATE SECURITY HARDWARE WITH SECURITY AND ELECTRICAL SYSTEMS. ENSURE POWER SUPPLY FUNCTIONSPROPERLY WITH ELECTRIC STRIKE.

HEADING #2

DOOR #: 102B, 104A

EACH DOOR TO HAVE:

3	HINGES	4B81
1	LOCKSET-OFFICE	CL50
1	CLOSER	C9016 x RAHO
1	KICK PLATE	KP50 x B4E x CSK
1	DOOR STOP	565/522 (AS REQ)
1	SET DOOR SEALS	5050

HEADING #3

DOOR #: 103, 119, 120, 122, 123, 143, 152, 153

EACH DOOR TO HAVE:

3	HINGES	4B81
1	PRIVACY SET	CL40
1	CLOSER	C9016 x RAHO
1	KICK PLATE	KP50 x B4E x CSK
1	MOP PLATE	MP50 x B4E x CSK
1	SET DOOR SEALS	5050
1	COAT HOOK	604

HEADING #4

DOOR #: 105, 129, 135

EACH DOOR TO HAVE:

3	HINGES	BB81
1	LOCKSET-CLASSROOM	CL70
1	OVERHEAD STOP	4424 (@ 129, 135)
1	ARMOR PLATE	AP50 x B4E x CSK (@ 154)
1	DOOR STOP	565/522 (AS REQ. @ 105)

HEADING #5

DOOR #: 109A, 116A, 151A

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24HD
1	PUSH/PULL SET	74L x 54M26C x TYPE 12 MTG.
1	CLOSER	C9016CUSH
1	KICK PLATE	KP50 x B4E x CSK
1	SET DOOR SEALS	5050

HEADING #6

DOOR #: 109B, 138B, 141A, 142, 144B, 151B

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET-STOREROOM	CL80
1	ELECTRIC STRIKE	55ABC
1	ACCCESS CONTROL	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	MOTION SENSOR	MD31D-W
1	CLOSER	C9016CUSH
1	KICK PLATE	KP50 x B4E x CSK
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
1	DOOR BOTTOM SEAL	200N

NOTE: COORDINATE SECURITY HARDWARE WITH SECURITY AND ELECTRICAL SYSTEMS. ENSURE POWER SUPPLY FUNCTIONSPROPERLY WITH ELECTRIC STRIKE.

HEADING #7

DOOR #: 111, 112, 113, 149, 150

EACH DOOR TO HAVE:

3	HINGES	BB81
1	LOCKSET-OFFICE	CL50
1	DOOR STOP	565/522 (AS REQ)
1	SET DOOR SEALS	5050
1	COAT HOOK	604

HEADING #8

DOOR #: 114

EACH DOOR TO HAVE:

3	HINGES	BB81
1	PRIVACY SET	CL40
1	CLOSER	C9016 x RAHO
1	KICK PLATE	KP50 x B4E x CSK
1	MOP PLATE	MP50 x B4E x CSK
1	SET DOOR SEALS	5050
1	COAT HOOK	604

HEADING #9

DOOR #: 115, 144A

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	PUSH/PULL SET	74L x 54M26C x TYPE 12 MTG.
1	CLOSER	C9016CUSH
1	KICK PLATE	KP50 x B4E x CSK

HEADING #10

DOOR #: 118, 138A EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24HD
1	PUSH/PULL SET	74L x 54M26C x TYPE 12 MTG.
1	CLOSER	C9016CUSH
1	KICK PLATE	KP50 x B4E x CSK
1	SET DOOR SEALS	5050
1	DOOR BOTTOM SEAL	200N

HEADING #11

DOOR #: 121, 140, 154, 155

EACH DOOR TO HAVE:

3	HINGES	4B81
1	LOCKSET-CLASROOM	CL70
1	CLOSER	C9016 x RAHO (@ 121, 154)
1	CLOSER	C9016HCNS (@140, 155)
1	KICK PLATE	KP50 x B4E x CSK
1	ARMOR PLATE	AP50 x BE x CSK (@ 154)
1	DOOR STOP	565/522 (AS REQ. @ 121, 155)
1	SET DOOR SEALS	5050

HEADING #12

DOORS #: 124, 139B, 139C

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET	CL80
1	CYLINDER	TO MATCH NEW SYSTEM
1	ELECTRIC STRIKE	55ABC
1	ACCESS CONTROL CARD READER	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	CLOSER	DC9016HCUSH
1	KICK PLATE	KP50 x B4E x CSK (@ 124)
1	ARMOR PLATE	AP50 x B4E x CSK (@ 139B, 139C)
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
1	DOOR BOTTOM SEAL	200N
1	DRIP CAP	17

NOTE: FINISH TO MATCH DOOR/FRAME. COORDINATE SECURITY HARDWAREWITH SECURITY AND ELECTRICAL SYSTEMS.

HEADING #13

DOORS #: 125

EACH PAIR TO HAVE:

6	HINGES	4B51 x NRP
1	SET FLUSHBOLTS	590 x 545 (INAACTIVE)
1	LOCKSET	CL80 (ACTIVE)
1	CLOSER	DC9016HCUSH (ACTIVE)
1	OVERHEADER HOLDER	4414 (INACTIVE)
2	ARMOR PLATES	AP50 x B4E x CSK
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
2	DOOR BOTTOM SEALS	200N
1	ASTRGAL SET	115
1	DRIP CAP	17
1	LATCH GUARD	621

HEADING #14

DOOR #: 127, 128, 130, 131, 133, 134, 136, 137

EACH DOOR TO HAVE:

1	SET TRACK HARDWARE	CFT-202-SS
2	FLUSH PULLS	FHIX05
1	PRIVACY LOCK	BD1000

HEADING #15

DOORS #: 139A, 139D

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET	CL50
1	CLOSER	DC9016HCUSH
1	ARMOR PLATE	AP50 x B4E x CSK
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
1	DOOR BOTTOM SEAL	200N
1	DRIP CAP	17
1	LATCH GUARD	621

HEADING #16

DOOR #: 139E, 139F, 139G, 139H, 139I, 139J

NOTE: ALL HARDWARE BY DOOR SUPPLIER.

HEADING #17

DOOR #: 141B

EACH PAIR TO HAVE:

1	CONTINUOUS HINGE	SL18HD x ATW8 (ACTIVE)
1	CONTINUOUS HINGE	SL18HD (INACTIVE)
1	SET FLUSHBOLTS	590 x 545 (INACTIVE)
1	LOCKSET-ELEC	CL80EU (ACTIVE)
1	ACCCESS CONTROL	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	MOTION SENSOR	MD31D-W
1	CLOSER	C9016CUSH (ACTIVE)
1	OVERHEADE STOP	4424 (INACTIVE)
2	KICK PLATES	KP50 x B4E x CSK
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
2	DOOR BOTTOM SEAL	200N
1	ASTRAGAL SET	115N

NOTE: COORDINATE SECURITY HARDWARE WITH SECURITY AND ELECTRICAL SYSTEMS. ENSURE POWER SUPPLY FUNCTIONSPROPERLY WITH ELECTRIC LOCK.

HEADING #18

DOOR #: 145A

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET-STOREROOM	CL80
1	ELECTRIC STRIKE	55ABC
1	ACCCESS CONTROL	SEE DIVISION 28 ACCESS CONTROL
1	POWER SUPPLY	SEE DIVISION 28 ACCESS CONTROL
1	MOTION SENSOR	MD31D-W
1	CLOSER	C9016 x RAHO
1	ARMOR PLATE	AP50 x B4E x CSK
1	DOOR STOP	565/522 (AS REQ.)

HEADING #19

DOORS #: 145B

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET-STAND ALONE ELEC	E75P
1	CLOSER	DC9016HCUSH
1	KICK PLATE	KP50 x B4E x CSK
1	THRESHOLD	425E
1	SET DOOR SEALS	160U
1	DOOR BOTTOM SEAL	200N
1	DRIP CAP	17
1	LATCH GUARD	621

HEADING #20

DOOR #: 147B

EACH DOOR TO HAVE:

3	HINGES	4B81
1	PASSAGE SET	CL10
1	CLOSER	C9016RAHO
1	KICK PLATE	KP50 x B4E x CSK
1	DOOR STOP	565/522 (AS REQ)
1	SET DOOR SEALS	5050

END OF SECTION 08 71 00

SECTION 08 80 00

GLAZING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Vision Lites
2. Entrances and Other Doors
3. Storefront Windows
4. Plate Glass Mirrors
5. Fire Rated Glazing

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 8, Section “Hollow Metal Doors and Frames”
2. Division 8, Section “Flush Wood Doors”
3. Division 8, Section “Aluminum Entrances and Storefronts”

1.03 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's directions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

E. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to cause other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer’s written instructions. Defects include discoloration, black spots and clouding of the silver film.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Specified Design Wind Loads: 300 psf.
   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      1) Load Duration: 60 seconds or less.
   c. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
      1) For monolithic-glass lites heat treated to resist wind loads.
      2) For insulating glass.
   d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
   e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 F deg (67 C deg), ambient; 180 F deg (100 C deg), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal ½-inch- (13-mm-) wide interspace.
3. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
4. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
5. Solar Optical Properties: NFRC 300.

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Glazing submittal to be completed only after pre-submittal meeting has taken place between Contractor, Owner, Architect, hollow metal frame supplier, hardware supplier, wood door supplier, and glazing supplier.

C. Product data for each glass product and glazing material indicated and required accessories.

D. Shop Drawings: Include elevations, edge details, hardware and attachments to other work for:

1. Window glazing and door glazing

E. Samples for verification purposes of 12-inch (300 mm) square samples of each type of glass indicated and 12-inch (300 mm) long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

F. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

G. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

H Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

I. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

J. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual"
2. LSGA Publications: "LSGA Design Guide"
3. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines" and TB-3001 "Sloped Glazing Guidelines"

B. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:

1. Insulating Glass Certification Council (IGCC)

2. Associated Laboratories, Inc. (ALI)
3. National Certified Testing Laboratories (NCTL)

C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a 5 year minimum record of successful in-service performance.

D. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Laminated glass of each (ASTM C 1172) kind indicated.
4. Insulating glass of each construction indicated.

E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer’s written instructions for shipping, storing and handling mirrors as needed to prevent deterioration of silvering, damage to edges and abrasion of glass surfaces and applied coatings.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.09 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Coated Glass or Insulated Glass Products: Submit written warranty signed by coated glass or insulated glass manufacturer agreeing to furnish replacements for those coated glass units that deteriorate as defined in "Definitions" article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated in schedules at the end of PART 3.

2.02 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated in schedule at the end of PART 3, and Quality q3 (glazing select).

1. Class 1 (clear) unless otherwise indicated.

2.03 TEMPERED GLASS PRODUCTS

A. Tempered Glass: ASTM C 1048, Type I (transparent flat glass); Quality-Q3, of class, kind and condition indicated. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat strengthened) float glass as indicated.

1. Class 1 (clear) unless otherwise indicated.

2.04 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of sealed lites of glass separated by dehydrated air spaces, and complying with ASTM E 774 and with other requirements specified in this section and in the schedule at the end of PART 3.

1. Provide heat-treated, coated float glass of kind indicated at the end of PART 3. Kind HS (heat strengthened) as specified and Kind FT (fully tempered) where safety glass is designated or required.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of PART 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surface of glass lites at unit's edge.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealant.

D. Spacer Specifications: Manufacturer's standard spacer material and construction.

E. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

1. Aluminum with mill black color-anodized finish.
2. Corner Construction: Manufacturer's standard corner construction.

2.05 FIRE RATED GLAZING MATERIALS

A. Approved Products:

1. Technical Glass Products (TGP) – Basis of Design
2. SaftiFirst Fire Rated Glazing Solutions
3. Architect approved equal prior to bid

B. Properties: Thickness 5/16", weight 4 lbs./sq. ft., Fire Rating 20 minutes to 3 hours for doors.

C. Labeling: Permanently label each piece of glass with company logo, UL logo and fire rating.

D. Refer to Drawings for basis of design product information.

2.06 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:

1. AAMA 804.1.

B. Products: Subject to compliance with requirements, provide one (1) of the following:

1. Back-Bedding Mastic Glazing Tape With Spacer Rod:
   a. PTI 303 Glazing Tape (with shim), Protective Treatments, Inc.
   b. Pre-shimmed Tremco 440 Tape, Tremco, Inc.
   c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
   d. Preshimmed Extra-seal Glazing Tape, Pecora Corp.

2.07 GLAZING GASKETS

A. Gaskets: As manufactured by Aluminum Entrances and Storefronts Manufacturer.

2.08 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-extruding, non-off-gassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistive rating.

2.09 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.03 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
2. Remove damaged glass from Project site and legally dispose of off-site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (1250 mm) (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
2. Provide 1/8-inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each lite is installed.

F. Apply heel bead of elastomeric sealant as recommended by sealant manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.08 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.09 GLAZING SCHEDULE

A. Refer to Drawings for all glazing types.

END OF SECTION 08 80 00

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.01 SUMMARY

A. Description of Work: Work of this section includes, but is not limited to, the following:

1. Gypsum board and accessories
2. Metal suspension systems
3. Gypsum board finishing
4. Trim and accessories

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 9, Section “Ceramic Tiling”

B. Division 9, Section “Acoustical Panel Ceilings”

C. Division 9, Section “Painting”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specificaiton Section 01 33 00.

B. Product Data: Submit manufacturer's specifications and installation instructions with Project conditions and materials clearly identified or detailed for each required system.

1.04 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:

1. Gypsum Board Partitions:
   a. Standard systems: Maximum deflection of l/240 of partition height.
   b. Systems to receive water resistant gypsum board or backer board: Maximum deflection of l/360 of partition height.
2. Interior Suspended Ceilings and Soffits: Maximum deflection of l/360 of distance between supports.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

C. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

1.05 QUALITY ASSURANCE

A. Reference Standards:

1. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are required, specify gypsum board assemblies that comply with requirements as follows in C, D and E.

2. Fire-Resistance Ratings shall comply with GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
3. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, specify materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
4. Gypsum Wallboard shall comply with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
5. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board" except for more stringent requirements of manufacturer.
5. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.
6. **Gypsum board manufactured outside the Continental United States is <u>not</u> permitted.**

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver material to site promptly without undue exposure to weather.
2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

B. Storage:

1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, rusting and damage.
3. Store board to be directly applied to masonry walls at 70°F for 24 hours prior to installation.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install gypsum board when ambient temperature is below 40°F.
2. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55°F from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. All gypsum board and finshing materials shall be provided by a single manufacturer.

B. Gypsum Board and Accessories: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL (Basis of Design).

C. Grid Suspension Assemblies: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL (Basis of Design).

D. Alternate Manufacturers:

1. Georgia Pacific Building Products (GP)
2. National Gypsum Corporation (NG)

3. Or Architect approved equal prior to Bid.

2.02 PRODUCTS

A. Typical Partitions and Ceilings Gypsum Board:

1. ASTM C1396 (Section 5), regular type.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated
4. Acceptable Products:
   a. SHEETROCK® brand SW by USG (Basis of Design).
   b. Or ToughRock® Fireguard X™ by GP.
   c. Or Gold Bond® Fire-Shield® Type X by NG.
   d. Or Architect approved equal prior to Bid.

B. Moisture/Mold Resistant Partitions and Ceilings Gypsum Board:

1. ASTM C1396 (Section 7), Type X.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated
4. Acceptable Products:
   a. Sheetrock® brand Mold Tough™ Firecode by USG (Basis of Design).
   b. Or ToughRock® Fireguard X™ Mold-Guard™ by GP.
   c. Or Gold Bond® XP® Fire-Shield Type X by NG.
   d. Or Architect approved equal prior to Bid.

C. Fire Rated Partitions and Ceilings Gypsum Board:

1. ASTM C1396 (Section 7), Type X.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated
4. Acceptable products:
   a. Sheetrock® brand Firecode® C Core by USG (Basis of Design).
   b. Or ToughRock® Fireguard X™ C Core by GP.
   c. Or Gold Bond® Fire-Shield C™ C Core by NG.
   d. Or Architect approved equal prior to Bid.

D. Tile Backerboard and Underlayment:

1. ASTM C1278 (Gypsum Based Tile Backer).
2. Edges: Square
3. Thickness: 5/8 inch, unless otherwise indicated
4. Acceptable products:
   a. Fiberock Tile Backerboard and Underlayment by USG (Basis of Design).
   b. Or DensShield Tile Backer by GP.
   c. Or Gold Bond® EXP® Tile Backer by NG.
   d. Or Architect approved equal prior to Bid.

2.03 CEILING SUPPORT MATERIALS

A. Hanger Anchorage Devices: Screws, clips, bolts or other devices compatible with indicated structural anchorage for ceiling hangers and whose suitability has been proven through standard construction practices or by certified test data.

B. Hangers:

1. Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
2. Wire: ASTM A 641, soft, Class 1 galvanized.
3. Rods and Flats:
    a. Mild steel components.
    b. Finish: Galvanized or painted with rust-inhibitive paint for interior work; galvanized for exterior work.

C. Framing System:

1. Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635, with exposed surfaces finished in manufacturer's standard enamel paint finish.
2. Fire Rating: Where required by Drawings provide one (1) hour rating in accordance with UL assembly indicated.
3. Components: Main tees, furring cross channels, furring cross tees, and cross tees.
4. Accessories:
    a. U-shaped channel molding.
    b. Galvanized carbon steel (12 ga.) hanger wire.
5. Acceptable Product:
    a. Drywall Suspension System by USG (Basis of Design)
    b. Or Drywall Flat Ceiling Suspension System by Armstrong.
    c. Or Drywall Ceiling Suspension System by Chicago Metallic
    d. Or Architect approved equal prior to Bid.

2.04 ACCESSORIES

A. Metal Trim for Gypsum Board:

1. All Gypsum wall board shall be finished with metal edges where abutting other materials.
2. Conform to profile and dimensions indicated.
3. Material for interior work: Galvanized steel, 26 gauge minimum.
4. Corner Beads: Equivalent to Dur-A-Bead No. 103 by USG.
5. Casing Beads (edge beads): Equivalent to 200A by USG.
6. Control Joints:
    a. Roll-formed zinc with perforated flanges.
    b. Size: 1-3/4 inch wide, with ¼ inch wide center channel.
    c. Provide with removable tape strip over channel.
    d. Acceptable Product: Equivalent to No. 093 by USG.

B. Paper-Faced Metal Trim for Gypsum Board:

1. Conform to profile and dimensions indicated.
2. Material for interior work: Comply with ASTM C1047.
3. Outside Corners: Paper Faced Metal Bead and Trim B1W series by USG.

4. Inside Corners: Paper Faced Metal Bead and Trim B2 by USG.
5. Trims: L shape – B4 SERIES by USG; J shape: B9 SERIES by USG.

C. Hanger Wire Sound Isolators: Provide where indicated for sound-rated suspended ceilings.

D. Adhesives and Joint Treatment Materials:

1. Conform to requirements of ASTM C475.
2. Joint Compounds:
   a. Drying-type (ready-mixed): Equivalent to SHEETROCK® brand taping joint compound and topping joint compound, or SHEETROCK® all purpose joint compound [or ready-mixed lightweight all purpose joint compound by USG.
   b. Setting (chemically-hardening) Type: Equivalent to SHEETROCK® brand setting-type joint compound by USG. Note: this is default for veneer plaster and FIBEROCK® brand panels.
   c. SHEETROCK® brand TUFF-HIDE™primer-surfacer: Finish Level 4 (GA-214/ASTM C-840) drywall surface with vinyl acrylic latex-based coating to achieve Level 5 gypsum board finish.
   d. Laminating adhesive for multiple layers: Special adhesive or joint compound specifically recommended for laminating gypsum boards.
   e. Laminating adhesive for direct application: Special adhesive or joint compound specifically recommended for laminating gypsum boards and for adhering gypsum boards to solid substrates.
   f. Reinforcing Joint Tape:
      1. ASTM C475, 2 inch nominal width.
      2. For backer board, provide fiberglass tape as recommended by board manufacturer.

E. Gypsum Board Screws: Self-drilling, self-tapping steel screws.

1. Fasteners for gypsum wallboard to supporting members shall be of the screw type recommended by manufacturer, except where other types of fasteners are specifically required.
2. Nail fasteners are not permitted.

F. Backer Board Accessories: Provide accessories and corrosion-resistant-coated steel screws as recommended by backer board manufacturer and required for complete installation.

G. Acoustical Sealant: Equivalent to to SHEETROCK® acoustical sealant by USG.

H. Z-Furring Insulation: See Specification Section 07 21 00 Building Insulation.

I. Miscellaneous Accessories: Fry Reglet, W-shape, ½”, clear anodized finish.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with reference standards and manufacturer's instructions and as required to comply with seismic requirements.

B. Tolerances:

1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
3. Shim as required to comply with specified tolerances.

C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

D. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings or similar construction.

3.03 METAL SUPPORT INSTALLATION

A. Metal Runners:

1. Align and secure runner tracks accurately to partition layout at both floor and ceiling.
2. Provide fasteners appropriate to substrate construction as recommended by manufacturer.

B. Hat Channel Furring:

1. Attach hat-shaped furring channels either vertically or horizontally with fasteners through alternate wing flanges (staggered).
2. Space furring channels at 16 inches on center, unless otherwise indicated. Where furring is indicated to receive backer board, water resistant gypsum board with ceramic tile, or veneer plaster, space at 16 inches on center.
3. Install furring channels within 4 inches of floor line and ceiling line.

C. Ceiling and Soffit Support Systems:

1. Secure hangers or rods to structural support by connecting directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners indicated.
2. Space main runners, hangers and furring according to requirements of ASTM C754, except as otherwise indicated.
3. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
5. Install compression posts, splay wires and other accessories as required to comply with seismic requirements.
6. Extend runners to within 6 inches of walls.
7. Wire-tie or clip furring members to main runners and to other structural supports indicated. In fire resistance rated assemblies, wire-tie furring members; do not clip.
8. Provide 1 inch clearance between furring or runners and abutting walls and partitions.
9. For proprietary framing system, comply with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs:

1. Loosely butt gypsum board joints together and neatly fit.
2. Do not place butt ends against tapered edges.
3. Maximum allowable gap at end joints: 1/8 inch.
4. Stagger joints on opposite sides of partitions.
5. Apply ceiling boards first where gypsum board ceilings and wall occur.

6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
7. Screw board in place securely with screws spaced according to manufacturer's recommendations.

B. Single Layer Gypsum Board on Furring:

1. Apply gypsum board with long dimension at right angles to studs.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to studs with screws spaced according to manufacturer's recommendations.

C. Double Layer Gypsum Board:

1. Fasten base layer to studs or furring with screws, and attach face layer using laminating adhesive and screws, applied according to manufacturer's instructions.
2. Offset face-layer joints at least 10 inches from parallel base-layer joints.
3. Screw both layers to metal supports at double layer ceiling applications and where required for fire-rated construction.

3.05 SOUND-RATED CONSTRUCTION

A. Insulation:

1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.
3. Fit carefully behind electrical outlets and other work penetrating sound-rated construction.

B. Gypsum Board:

1. Install gypsum board same as for interior partitions and ceilings.
2. Coordinate with installation of perimeter sealants.

C. Acoustical Sealant:

1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.
2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
3. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.
4. After installation of gypsum board base layers, cut face layer sheets ½ inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
6. Seal sides and backs of electrical boxes to completely close off openings and joints.

D. Sound Flanking Paths:

1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
2. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.06 ACCESSORY INSTALLATION

A. Trim:

1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

B. Control Joints:

1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Install control joints within long runs of partitions, ceilings or soffits at approximately 25'-0" on center or as indicated.

C. Access Panels: Access panels shall be provided in all assemblies for any equipment or item requiring maintenance or periodic replacement.

3.07 FINISHING

A. Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, "Recommended Specification: Levels of Gypsum Board Finish".

1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
3. Level 3: Gypsum board surfaces, where textured finishes or heavy vinyl wall papering will be used or USG First Coat primer.
4. Level 4: Gypsum board surfaces, except where another finish level is indicated USG First Coat primer.
5. Level 5: Gypsum board surfaces requiring extra smooth surface for critical light, where indicated using spray-applied Primer-Surfacer, TUFF-HIDE:
   a. Surface Preparation: Complete gypsum board surface to Level 4 before applying SHEETROCK® TUFF-HIDE™ primer-surfacer.
   b. TUFF-HIDE primer-surfacer, Application: Machine apply with airless sprayer in conformance with USG application instructions to a wet film thickness of 15 to 20 mils. Surface may be painted after overnight drying.
6. Ceiling soffits shall have a level 5 finish and have expansion joints at intersecting corners.

B. Interior Gypsum Board:

1. All Gypsum finishing shall be accomplished by vacuum sanding.
2. Prefill:
   a. Use setting-type joint compound. Mix joint compound according to manufacturer's directions.
   b. Fill joints between boards flush to top of eased or beveled edge.
   c. Fill joints of gypsum board above suspended ceilings in fire-rated partitions.
   d. Wipe off excess compound and allow compound to harden.
3. Taping (Level 1):
   a. Use taping or all purpose conventional weight compound.
   b. Butter taping compound into inside corners and joints.

c. Center tape over joints and press down into fresh compound.
d. Remove excess compound.
e. Tape joints of gypsum board above suspended ceilings.

4. First Coat (Level 2):
   a. Use taping or all-purpose conventional weight drying-type compound, or setting-type joint compound.
   b. Immediately after bedding tape, apply skim coat of compound over body of tape and allow to dry completely in accordance with manufacturer's instructions.
   c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
5. Second Coat (Level 3): Use all purpose or topping conventional weight drying type joint compound. After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.
6. Third Coat (Level 4):
   a. Use all purpose or topping conventional weight drying type joint compound.
   b. After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.
   c. Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
7. Skim Coat (Level 5):
   a. Apply skim coat of all-purpose conventional weight drying-type compound or spray-applied Primer-Surfacer, TUFF-HIDE over exposed surfaces of gypsum board.
   b. After skim coat has dried, touch-up and sand to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.

C. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.

1. For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.
   a. Do not crown joints or leave excess compound on panels.
   b. Remove tool marks and ridges.
   c. For fastener heads to be covered with tile, apply one coat of joint compound.

D. Joint Compound:

1. After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.
2. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
3. Allow joint compound to completely set before applying veneer plaster finish.

E. Trim:

1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.

F. Control Joints: Install where indicated and specified.

G. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

3.08 ADJUSTING

A. Correct damage and defects which may telegraph through finish work.

B. Leave work smooth and uniform.

END OF SECTION 09 21 16

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Work: Work of this section includes, but is not limited to, the following:

1. Glazed ceramic floor and wall tile.
2. Stone thresholds installed as part of tile installations.
3. Waterproof membrane for thin-set tile installations.
4. Metal edge strips installed as part of tile installations.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each product indicated, include maintenance literature.

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.

D. Samples:

1. Each type, composition, color, and finish of tile.
2. Assembled samples with grouted joints for each type, composition, color, and finish of tile and engineered stone.
   a. Certain grout colors may stain engineered stone. A sample must be prepared prior to ordering to ascertain that the appearance of the stone will not be altered.
3. Stone thresholds in 6-inch (150-mm) lengths.

E. Quality Control Submittals:

1. Test Reports: Reports from an independent testing laboratory indicating that each type of tile furnished meets the performance requirements specified.
2. Certificates: Master Grade Certificate for each type of tile, signed by the manufacturer and the Contractor’s installer.

F. Contract Closeout Information:

1. Maintenance data.
2. Letter stating extra material has been delivered.

1.03 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample Submittals and qualities of materials and execution.

1. Build mockup of 8’x 8’ area of each type of tile installation.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
3. Manufacturer to supply a written Quality Assurance Program and Procedure Manual.

1.04 WARRANTY

A. Provide a Full System Warranty for all tile work on this Project from the installation materials manufacturer for a period of not less than 10 years from date of Substantial Completion. Consult manufacturer for product or application questions.

1.05 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

1.06 JOB CONDITIONS:

A. Assure temperature is maintained at minimum 50 deg F during tile work and for minimum of 7 days after completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Daltile, which is located at: 7834 C.F. Hawn Fwy. P.O. Box 170130; Dallas, TX 75217; ASD. Toll Free Tel: 800-933-TILE; Tel: 214-398-1411; Fax: 214-309-4584; Web: www.daltile.com.

B. Alternate Manufacturers:

1. American Olean; Div. of Dal-Tile International Corp.
2. Specialty Tile.
3. Trinity Tile.
4. Or Architect approved equal prior to Bid.

2.02 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

B. Glazed Porcelain Ceramic Floor Tile: CT-1 Refer to Drawings.

C. Glazed Ceramic Floor Tile: CT-2 Refer to Drawings

D. Colorbody Porcelain Wall Tile: CT-3 Refer to Drawings.

C. Glazed Wall Tile Trim Units: Matching characteristics and colors of adjoining flat tile and coordinated with sizes and coursing where applicable. Used only at wall with tile.

1. Bullnose: At exposed edges of tile provide bullnose trim, standard module size to match adjoining flat tile.
2. Corner Beads: Interior and Exterior corner beads, standard module sizes

2.03 ACCESSORY MATERIALS

A. Waterproofing and Crack-Suppression Membranes:

1. Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10.
2. **Waterproofing and Crack Prevention Membrane: RedGard (Basis of Design)**
   a. **This is to be a waterproofed installation. Tie RedGard into all drain flanges and flash up perimeter walls and any in-field interruptions like columns, chases or wing walls to a height of 8" to form a watertight area.**
   b. **In shower areas waterproofing membrane shall extend up walls to underside of ceiling.**

B. Metal Trim: Satin natural anodized extruded aluminum, stainless steel, brass, as selected, style and dimensions to suit application, for setting using tile mortar or adhesive:

1. Basis of Design Manufacturer: Schulter Systems.
2. Use in following locations:
   a. Where indicated on Drawings.
   b. Open edges of floor tile.
   c. Cove transition from wall tile to floor tile.
   d. Transition between floor finishes of different heights.
   e. Thresholds at door openings.
   f. Expansion and control joints, floor and wall.

C. Stone Thresholds: Provide stone thresholds uniform in color and finish and fabricated as follows:

1. Material:
   a. Marble, complying with ASTM C 503 for exterior use and with a minimum abrasive hardness of 10 when tested in accordance with ASTM C 241.
2. Color/Finish: As selected from the manufacturer's standard range.
3. Size: Fabricated in the sizes and profiles as indicated on Drawings.
4. Location: Provide in locations as indicated on Drawings.

2.04 SETTING AND GROUTING MATERIALS

A. Available Manufacturers:

1. Custom Building Products (Basis of Design)
2. LATICRETE International, Inc.
3. MAPEI Corporation

B. Thin Set Bonding Mortar-ANSI A118.4:

1. For wall applications, provide non-sagging mortar.
2. Basis of Design Product: Custom Building Products ProLite Thin Set Mortar

C. Grout- Meeting Performance Characteristics of ANSI A118.7 and A118.3:

1. Basis of Design Product: Custom Building Products Fusion Pro Single Component Grout
   a. Refer to Drawings for Color Selection.

D. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3

E. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.

2.05 MISCELLANEOUS MATERIALS

A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

1. ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated.
   a. Available Products:
      1) Mameco International, Inc.; Vulkem 245.
      2) Pecora Corporation; NR-200 Urexpan.
      3) Tremco, Inc.; THC-900.

B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surfaces shall be plumb, level, and true with square corners, maximum variation from required plane shall be 1/8” in 10 feet. Concrete surface to be troweled with a broom finish with no curing compounds.

B. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

C. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.

D. Remove protrusions, bumps, and ridges by sanding or grinding.

E. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

F. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.02 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules and refer to Manufacturer’s installation instructions.

1. Grouting:
   a. Prepare, mix, and apply latex Portland cement grout mix in strict adherence with material manufacturer’s instructions.
   b. Ensure full penetration of entire joint depth. Extra care should be exercised during grouting so that the grout joints are left over-filled and a heavy grout film is left on the surface of the tile.
   c. Allow grout to cure; normally 48 hours.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. NTMA Installation Guidelines: Comply with specified provisions and recommendations of NTMA.

D. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

F. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

J. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

K. Install metal cove at all transitions from floor tile to wall tile.

L. Install tile on walls with the following joint widths:

1. Glazed Wall Tile: 1/8 inch (1.6 mm).

M. Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.03 WALL TILE INSTALLATION SCHEDULE

A. Interior wall installation; thin-set mortar; over gypsum board; TCA W243.

1. Thin-Set Mortar: Latex- portland cement mortar.

2. Grout: Epoxy grout.

END OF SECTION 09 30 13

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each product indicated.

C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Details to show compliance with Category “D” Seismic restraints.

D. Samples: For each acoustical panel, for each exposed suspension system member and for each color and texture required.

E. Product Test Reports.

F. Research/Evaluation Reports.

G. Maintenance Data.

1.03 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:

1. Fire-Resistance Ratings: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Ratings are indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   a. Identify materials with appropriate markings of applicable testing and inspecting agency.
2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.

C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup in a room as selected by the Architect to set standards and quality levels to adhere to.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed, but not fewer than 5 tiles.

1.05 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures included, but are not limited to:

1. Acoustical Panels: Sagging and warping.
2. Grid System: Rusting and manufacturer’s defects.

B. Warranty Period:

1. Acoustical Panels: Ten (10) years from date of Substantial Completion.
2. Grid System: Ten (10) years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

A. Acoustical Panel Standard: Comply with ASTM E 1264.

B. Metal Suspension System Standard: Comply with ASTM C 635.

C. Attachment Devices: Size for five (5) times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Seismic struts and seismic clips (refer to Drawings and as recommended by manufacturer).

F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.02 ACOUSTICAL CEILING PANELS.

A. Acceptable Manufacturers: Other manufacturers desiring approval must comply with Specification Section 01 63 00 Product Substitution Procedures.

1. USG (Basis of Design)
2. Armstrong
3. Certainteed
4. Architect approved equal.

B. ACT-1 – Standard 2’ x 2’ Acoustical Ceiling Tile System:

1. Areas of Use: General office space, storage, classrooms, vestibules and circulation areas.
2. Ceiling Tile: Frost ClimaPlus by USG.
   a. Size: 24” x 24” x 3/4”
   b. Edge: FL – Flush Reveal
   c. Color: **Flat White**
   d. LR: Not less than 0.84
   e. NRC: Not less than 0.70
   f. CAC: Not less than 36
   g. Fire rating: Class A - UL labeled
3. Suspension Grid: USG DONN Brand DX/DXL 15/16” ™ Acoustical Suspension System.
   a. Color: **Flat White**
   b. Structural Classification: Intermediate Duty
   c. Tee Profile: Narrow Face 15/16”
   d. Tee Height: 1 ½”
   e. Fire rating: Class A - UL labeled, Firecode®
   f. Seismic Design Category: C

C. ACT-2 – Standard 2’ x 2’ Acoustical Ceiling Tile System: Areas of Use: General office space, storage, classrooms, vestibules and circulation areas.

1. Ceiling Tile: Frost ClimaPlus by USG.
   a. Size: 24” x 24” x 3/4”
   b. Edge: FL – Flush Reveal
   c. Color: **Flat Black**
   d. LR: Not less than 0.84
   e. NRC: Not less than 0.70
   f. CAC: Not less than 36
   g. Fire rating: Class A - UL labeled
2. Suspension Grid: USG DONN Brand DX/DXL 15/16” ™ Acoustical Suspension System.
   a. Color: **Flat Black**
   b. Structural Classification: Intermediate Duty
   c. Tee Profile: Narrow Face 15/16”
   d. Tee Height: 1 ½”
   e. Fire rating: Class A - UL labeled, Firecode®
   f. Seismic Design Category: C

D. ACT-3 Wet Location Vinyl Coated 2’ x 2’ Acoustical Ceiling Tile System:

1. Areas of Use: Kitchens, Triage and other areas subject to high humidity levels and potential sagging.
2. Ceiling Tile: USG Interiors, LLC, “Clean Room”
   a. Size: 24” x 24” x 5/8”
   b. Edge: SQ - Square
   c. Color: Flat White 050
   d. LR: Not less than 0.79
   e. NRC: Not less than 0.55

f. CAC: Not less than 35
g. Fire rating: Firecode®

3. Suspension Grid: USG DONN Brand DX/DXL 15/16" ™ Acoustical Suspension System.
   a. Color: Flat White 050
   b. Structural Classification: Intermediate Duty
   c. Tee Profile: Narrow Face 15/16"
   d. Tee Height: 1 ½"
   e. Fire rating: Class A - UL labeled, Firecode®
   f. Seismic Design Category: C

E. ACT-4 – Stainless Steel 2' x 2' Ceiling Tile System:

1. Areas of Use: 24" minimum around perimeter of kitchen range hood.
2. Ceiling Tile: 18 ga. Stainless Steel
   a. Size: 24" x 24" x 0.048" (18 ga.)
   b. Edge: SQ - Square
   c. Color: No 4 – Brushed Finish
3. Suspension Grid: USG DONN Brand DX/DXL 15/16" ™ Acoustical Suspension System.
   a. Color: Flat White 050
   b. Structural Classification: Intermediate Duty
   c. Tee Profile: Narrow Face 15/16"
   d. Tee Height: 1 ½"
   e. Fire rating: Class A - UL labeled, Firecode®
   f. Seismic Design Category: C

F. Accessories:

1. Acoustical Sealant:
   a. Non-hardening, non-bleeding, water base type

2.05 METAL SUSPENSION SYSTEM

A. Acceptable Manufacturers: Other manufacturers desiring approval must comply with Specification Section 01 63 00 Product Substitution Procedures.

1. USG (Basis of Design)
2. Armstrong
3. Certainteed
4. Architect approved equal.

B. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-)wide metal caps on flanges, 1-1/2" nominal height main tees, material thickness as required to meet specified structural duty classification, with 4'-0" long cross tees.

1. Structural Classification: Intermediate Duty
2. Main runner jointing by spliced, interlocking ends, tab locks, pin locks, or other suitable conditions.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type interlocking with main runners.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Factory applied low gloss white paint.
6. Provide channel or angle shaped edge molding with minimum 0.020" thickness, ¾" flange width, hemmed edge.

C. Hangers:

1. Galvanized, soft annealed steel wire for general use

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Contractor's Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

B. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices.

1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
2. Do not attach hangers to steel deck tabs or to steel roof deck.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate with concealed fasteners at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. In the manner directed by the Architect.

2. Or square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.04 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Resilient Rubber Athletic Flooring (RT-1)
2. Luxury Vinyl Plank Flooring (LVT-1)

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each product indicated.

1. Manufacturer’s product data, installation maintenance data and warranty.

C. Samples: Provide samples for verification of such characteristics as color, texture and finish.

1. Full-size units of each color and pattern of resilient floor tile required.

D. Provide shop Drawings prepared for the Project illustrating layouts, seam layouts, details, location and type of all edge moldings required, dimensions and other data for sheet goods.

1.03 DELIVERY, STORAGE AND HANDLING

A. Materials must be delivered in Manufacturer’s original, unopened and undamaged containers with identification labels intact.

B. Store material upright on a clean, dry, flat surface protected from all possible damage and protect from exposure to harmful weather conditions. Store per manufacturer’s recommendations.

C. If material is flattened or distorted during storage or transporting, do not attempt to install it.

D. Marking pens, felt-tipped markers, or waxed crayons must not be used to write on the vinyl backing nor used to mark layout on the under floor, as they could bleed through and stain the material.

1.04 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 degrees F or more than 86 degrees F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 65 degrees F or more than 95 degrees F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.05 QUALITY ASSURANCE

A. Manufacturer must be certified ISO 9001 and ISO 14001.

B. Contractor's installer must be recognized and approved respectively by rubber athletic flooring manufacturer and vinyl flooring manufacturer for shower floor installations.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide 2% of total floor surface of each type, color and dye lot of r flooring.

PART 2 - PRODUCTS

2.01 RESILIENT RUBBER ATHLETIC FLOORING (RT-1)

A. Manufacturers:

1. Mannington Flooring (Basis of Design)
2. Johnsonite Inc. / Tarkett
3. Roppe
4. Architect approved equal.

B. Product Type: Resilient Rubber Tile

C. Tile Texture: Hammered speckled

D. Tile Color: Refer to Drawings.

E. Tile Style and Size: Square Edge (glue down) 24" x 24"

F. Thickness: 9.5mm (3/8")

2.02 LUXURY VINYL PLANK FLOORING (LVT-1)

A. Manufacturers:

1. Mohawk Group (Basis of Design)
2. Mannington Commercial
3. Armstrong Flooring
4. Architect approved equal.

B. Product Type: Click LVT

C. Color and Pattern: Refer to Drawings

D. Size: 7.5" x 52"

E. Thickness: 4.2 mm

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

1. **Leveling of floors required prior to installation of resilient flooring shall be the responsibility of the Contractor and included in contract.**

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Moisture Mitigation: Contractor shall provide moisture vapor barrier as recommended by flooring manufacturer at all locations where subfloor moisture and pH testing does not meet manufacturer requirements.

1. **Moisture mitigation of subfloor shall be the responsibility of the Contractor and included in the contract.**

D. Metal Edge Strips: Extruded aluminum with mill finish, of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints. Refer to Drawings for edge strip locations and type.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Concrete to be placed a minimum of 28 days prior to installation of rubber athletic flooring.
3. Concrete on/or below grade are installed over a suitable moisture retardant membrane. Water vapor membrane complies with specifications in ASTM E1745.
4. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
5. Moisture Testing:
   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. All flooring product installations shall be in strict compliance with manufacturer's requirements.

B. All flooring product installations shall comply with RFCI Resilient Flooring Covering Institute.

C. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis in pattern indicated.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Install rubber athletic flooring (RF-1) and sheet vinyl flooring (SV-1) in strict accordance with the Manufacturer's current printed Installation Manual.

J. Repair:

1. Repairs for the rubber athletic flooring must be made from same dye lot as material supplied for initial installation.
2. Repairs are to be made by a qualified installer/technician only.

K. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

L. Do not wash surfaces until after time period recommended by manufacturer.

M. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 00

SECTION 09 65 13

RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Wall base.
2. Molding accessories.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each product indicated.

C. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 6 inches long, of each resilient product color, texture, and pattern required.

1.03 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.04 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other PART 2 articles.

B. Acceptable Manufacturers:
1. Johnsonite/Tarkett (Basis of Design)
2. Roppe Corporation, USA

3. Armstrong World Industries, Inc.
4. Architect approved equal. Other manufacturers desiring approval must comply with Specification Section 01 63 00 Product Substitution Procedures.

2.02 PRODUCTS

A. RESILIENT WALL BASE

1. Colors and Patterns: Refer to Drawings.
2. Type: TS (rubber, vulcanized thermoset).
3. Group (Manufacturing Method): I (solid).
4. Style: Cove Base at hard flooring; Straight Base at carpet flooring;
5. Minimum Thickness: 0.125 inch (3.2 mm).
6. Height:
   a. Standard: 4 inches (102 mm)
   b. Wet Locations: 6 inches (152.1mm)
7. Lengths:
   a. Coils in manufacturer's standard 120’ length.
   b. **48” pre-cut lengths will not be acceptable**.
8. Outside Corners: Premolded.
9. Inside Corners: Job formed or pre-molded.
   a. If job-formed, provide a tight corner and prepare a field mock-up to be approved for all corners to conform to.
10. Surface: Smooth.

B. RESILIENT TRANSITIONS

1. Description: ADA compliant resilient rubber transition and reducer strips for floor covering.
   a. Joiner for LVT and carpet tile.
   b. Joiner for LVT and rubber athletic flooring.
   c. Reducer for LVT to concrete.
   d. Reducer for carpet tile to concrete.
2. Shapes and Sizes: Refer to Drawings.
3. Colors: To match resilient wall base color.
4. Type: TS (rubber, vulcanized thermoset).
5. Group (Manufacturing Method): I (solid).
6. Style: Refer to drawings.
7. Lengths:
   a. 36” pre-cut lengths
   b. 48” pre-cut lengths where required due to opening width
8. Surface: Smooth.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners:

1. Outside Corners (acceptable only with approved mock-up to maintain standard): Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.03 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
   a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 13

SECTION 09 67 23

RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.

1. Application Method: Metal, power or hand troweled.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.

C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy mortar based system). Equivalent materials of other manufactures may be substituted only on approval of Architect. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section.

Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
   a. Include 48-inch (1200-mm) length of integral cove base.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference:

1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
2. Attendance:
   a. General Contractor
   b. Architect/Owner's Representative.
   c. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include,

1. Build of Broadcast or liquid rich type systems will not be accepted, and will result in a disqualification from bid.

B. Acceptable Manufactures,

1. Sherwin Williams (Basis of design)
2. Stonehard
3. Architect approved equal.

C. Products: Subject to compliance with requirements:

1. Sherwin Williams Fastop Multi Topfloor SL 23 (EP-1 and EP-2)

D. System Characteristics:

1. Color and Pattern: Refer to Drawings.
2. Wearing Surface: Slip resistant finish.
3. Integral Cove Base: 6” High
4. Overall System Thickness: nominal 1/4”

E. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. 1st Coat:
   a. Material Basis: Resuflor Aqua 3477 applied at 250 sq. ft. / gal.
   b. Resin: Epoxy
   c. Number of Coats: (1) one.

2. 2nd Coat:
   a. Material design basis: FasTop 4100 with 5127 applied at 250 sq. ft. / unit.
   b. Resin: Epoxy.
   c. Formulation Description: Boradcast 40-60 mesh silica sand 5310-7 at 0.5 lbs per sq. ft. to excess into wet slurry to achieve 1/8” thickness
   d. Thickness of Coats: nominal 1/8 inch
   e. Number of Coats: (1) one

3. 3rd Coat:
   a. (EP-1) Material design basis color: Seal Coat Resuflor 3746 #54 Steel Gray applied at 100 sq. ft. / gal.
   b. (EP-2) Accent Stripe design basis: Resufloor 3746 SW6868 Real Red applied at 100 sq. ft. / gal.
   c. Resin: Epoxy.
   d. Type: pigmented.
   e. Finish: standard.
   f. Number of Coats: (1) one.

4. Top Coat:
   a. Resutile 4638 applied at 400-500 sf / gal required as additional seal coat for areas exposed to UV. Match to corresponding Resuflor 3746 colors above.
   b. Number of Coats: (1) one.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

F. System Physical Properties: Provide high-performance resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 10,000 psi after 7 days per ASTM C 579.
2. Tensile Strength: 1,750 psi per ASTM C 307.
3. Flexural Strength: 4,000 psi per ASTM C 580.
4. Water Absorption: < 1% per ASTM C 413.
5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
6. Flammability: Class 1 per ASTM E-648.
7. Hardness: .85 to .90, Shore D per ASTM D 2240.
8. Flexural Modulus of Elasticity: $2.0x10^{6}$ psi per ASTM C-580
9. Thermal Coefficient of Linear Expansion: $1.4x10^{-5}$ in./in.˚F per ASTM C-531

2.2 ACCESSORY MATERIALS

A. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, and dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:
   a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or Diamond grind with a dust free system. (Acid etch not allowed per manufacturer's instructions)
2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates meet the following requirements.
   a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
   b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 6 lb of water/1000 sq. ft. of slab in 24 hours.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
   a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.

1. Integral Cove Base: 6 inches high.

D. Apply metal trowel single mortar coat in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

E. Apply topcoat(s) in number of coats indicated for flooring system instructions and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS

A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General contractor responsible for cleaning prior to inspection.

END OF SECTION 09 67 23

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes modular, tufted carpet tile.

B. Related Sections include the following:

1. Division 9 Section “Resilient Flooring” and “Resilient Wall Base and Accessories” for resilient wall base and accessories installed with carpet and carpet tile.

1.3 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

C. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Pattern of installation.
4. Pattern type, location, and direction.
5. Pile direction.
6. Type, color, and location of edge, transition, and other accessory strips.
7. Transition details to other flooring material.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and other Accessory Stripping: 6-inch- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

H. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

I. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects of pattern lay-out and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

D. All carpet tiles, products and accessories are to be from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet before installing these items.

1.7 WARRANTY

A. Commercial Lifetime Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Warranty shall cover the following under normal useful life of the carpet:
   a. Wear: Carpet tiles will not wear more than 10% of their surface pile weight from abrasive wear. “Abrasive wear” means fiber loss from the carpet tiles through normal abrasion, not crushing or flattening of the carpet pile in any area, nor staining, soiling, fading, or change in carpet appearance, nor fiber loss due to abnormal usage of the carpet tiles.
   b. Static: Carpet tiles will not give static discharges in excess of 3.5 KV when tested under AATCC Test Method 134 (Step).
   c. Edge Ravel/Zippering: Carpet tiles will not edge ravel or zipper.
   d. Delamination: Carpet tiles will not delaminate (chair pads are recommended for maximum appearance retention and to deter delamination).
   e. Dimensional Stability: Carpet tiles will not lose their dimensional stability per the AACHEN test ISO 2551.

B. Limited Stain Warranty:

1. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers:

1. Bentley Mills Group (Basis of Design for CPT-1, CPT-2)
2. Mohawk Group (Basis of Design for WM-1)
3. Mannington
4. Tarkett
5. Architect approved equal.

2.2 PRODUCTS

A. Carpet Tile (CPT-1, CPT-2):

1. Construction: Tufted
2. Size: 18” x 36”
3. Backing: NexStep Cushion Tile

4. Fiber Type: Nylon type 6,6
5. Color: Refer to drawings
6. Installation Method: Brick
7. Static: AATCC-134 Under 3.5KV
8. Flammability: Passes Methenamine Pill Test (CPSC-FF1-70)
9. Smoke Density: ASTM E662 Less than 450

B. Walk-off Matt Carpet Tile (WM-1):

1. Construction: Tufted
2. Size: 24” x 24”
3. Backing: EcoFlex NXT
4. Fiber Type: Duracolor Premium Nylon
5. Color: Refer to drawings
6. Installation Method: Quarter Turn
7. Static: AATCC-134 Under 3.5KV
8. Flammability: ASTM E 648 Class 1 (Glue Down)
9. Smoke Density: ASTM E 662 Less than 450

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

1. **Leveling of floors required prior to installation of carpet tile flooring shall be the responsibility of the Contractor and included in contract.**

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and sub-floor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

C. Contractor shall provide moisture vapor barrier as recommended by flooring manufacturer at all locations where subfloor moisture and pH testing does not meet manufacturer requirements.

1. **Moisture mitigation of subfloor shall be the responsibility of the Contractor and included in the contract.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of flooring products.

C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:
   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet or carpet tile.
5. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

D. Contractor shall install moisture vapor barrier as recommended by flooring manufacturer at all locations where subfloor moisture and pH testing does not meet manufacturer requirements.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Sweep and vacuum clean substrates to be covered by flooring products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet and carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet/tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet/ tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders and per Floor Finish Plan

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet/ tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet/ tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes surface preparation and field painting of exposed interior items and surfaces.

B. This section includes the painting of defined areas for projection purposes. Coordination with other trades is required.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each product indicated.

C. Samples: For each type of finish-coat material indicated.

1.03 QUALITY ASSURANCE

A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.

1. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m).
2. Final approval of colors will be from benchmark samples which upon approval can be incorporated into final Project finish.

1.04 PROJECT CONDITIONS

A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.05 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Five (5%) percent, but not less than 1 gal. (3.8 L), or one (1) case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other PART 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Acceptable Manufacturers:
   a. Basis of Design:
      1) Sherwin-Williams Co. (Sherwin-Williams)
   b. Optional:
      1) PPG Industries, Inc. (Pittsburgh Paints)
      2) Porter Paint Co.
      3) Duron
      4) Or Architect approved equal prior to Bid.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names may be listed other PART 2 articles:

2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Colors: As indicated in the Finish Schedule.

2.03 PREPARATORY COATS

A. Concrete Unit Masonry Block Filler: High-performance block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

B. Exterior Primer: Exterior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive metal primer.
2. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

C. Interior Primer: Interior latex-based of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
2. Zinc-Coated Metal Substrates: Galvanized metal primer.
3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.04 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint:

1. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series.

B. Interior Low-Luster Acrylic Enamel:

1. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W2200 Series.

C. Interior Semigloss Acrylic Enamel:

1. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series.

D. Epoxy- Polyamide:

1. Sherwin-Williams; Tile Clad High Solids B62Z Series.

PART 3 - EXECUTION

3.01 APPLICATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
   c. If transparent finish is required, backprime with spar varnish.

d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
   a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

E. Material Preparation:

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
4. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

G. Sand lightly between each succeeding enamel or varnish coat.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Omit primer over metal surfaces that have been shop primed and touchup painted.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

K. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

L. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

M. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

N. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

O. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

3.02 CLEANING AND PROTECTING

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.03 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal:

1. Acrylic Finish: Two (2) finish coats over a rust-inhibitive primer.

Semi-Gloss Finish:

1st Coat:	S-W Pro Industrial™ Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
2nd Coat:	S-W Metalatex Acrylic Semi-gloss coating, B42 Series
3rd Coat:	S-W Metalatex Acrylic Semi-gloss coating, B42 Series (4 mils wet, 1.5 mils dry per coat)

B. Aluminum & Galvanized Metal:

1. Acrylic Finish: Two (2) finish coats over a rust-inhibitive primer.

Semi-Gloss Finish:

1st Coat:	S-W Pro Industrial™ Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
2nd Coat:	S-W Metalatex Acrylic Semi-gloss coating, B42 Series
3rd Coat:	S-W Metalatex Acrylic Semi-gloss coating, B42 Series (4 mils wet, 1.5 mils dry per coat)

3.04 INTERIOR PAINT SCHEDULE

A. Concrete Floors-Sealed Concrete (SC-1 finish):

1. Solvent-Borne Acrylic System: Clear:

1st Coat:	S-W H&C® High Performance Industrial Clear Sealer
2nd Coat:	S-W H&C® High Performance Industrial Clear Sealer (75-250 sq/ft. per gallon)

C. Concrete and Masonry (Other Than Concrete Unit Masonry):
Refer to Epoxy Paint Schedule below for CMU masonry finish requirements.

1. Egg-Shell / Satin Finish:

1st Coat:	S-W PrepRite® Masonry Primer, B28W300 (7 mils wet, 3 mils dry)
2nd Coat:	S-W ProMar® 200 Latex Eg-Shel, B20W2200 Series
3rd Coat:	S-W ProMar® 200 Latex Eg-Shel, B20W2200 Series (4 mils wet, 1.6 mils dry per coat)

D. Gypsum Board:

Finish Coats: Interior flat acrylic paint at gypsum board ceilings and eggshell or satin acrylic enamel at all other gypsum board surfaces.

1. Eggshell-Low Odor - Low VOC:

1st Coat:	S-W ProGreen™ 200 Interior Latex Primer, B28W600 Series (4 mils wet, 1.5 mils dry)
2nd Coat:	S-W ProGreen™ 200 Interior Latex Eg-shel, B20W651
3rd Coat:	S-W ProGreen™ 200 Interior Latex Eg-shel, B20W651 (4 mils wet, 1.6 mils dry per coat)

E. Ferrous Metal:

Finish Coats: Interior semi-gloss acrylic enamel for metal doors and frames and general metals throughout and full-gloss acrylic enamel for metal guardrails, handrails, stringers and underside of steel.

1. Semi-Gloss Finish:

1st Coat:	S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2nd Coat:	S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series
3rd Coat:	S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series (4 mils wet, 1.3 mils dry per coat)

F. Wood and Hardboard Trim-Painted:

1. Gloss Finish:

1st Coat:	S-W PrepRite® ProBlock Latex. B51 Series (4 mils wet, 1.4 mils dry)
2nd Coat:	S-W ProMar® 200 Latex Gloss, B21W200 Series
3rd Coat:	S-W ProMar® 200 Latex Gloss, B21W200 Series

3.05 EPOXY PAINT SCHEDULE

In color indicated to match general paint color numbering system.

A. High Humidity, Wet Areas, and **all CMU Walls**:

1. **Epoxy Systems (Solvent Base Finish) - Semi-Gloss Finish**:

1st Coat:	S-W Pro-Industrial Primer (18 mils wet, 10 mils dry)
2nd Coat:	S-W Pro Industrial HP Epoxy, B67-200 Series
3rd Coat:	S-W Pro Industrial HP Epoxy, B67-200 Series (4-8 mils dry per coat)

END OF SECTION 09 91 00

SECTION 09 95 00

WALL COVERINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes the following:

1. Vinyl wall covering.
2. Marker board wall covering

1.2 SUBMITTALS

A. Product Data for each type of adhesive and product specified. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Shop Drawings showing location and extent of each wall covering type. Indicate seams and termination points.

C. Samples for verification in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

1. Wall Covering Material: Full-width sample, not less than 36 inches long, from dye lot used for the Work.

a. Submit sample with specified treatments applied.
b. Mark top and face of material.
c. Show complete pattern repeat.

D. Schedule of wall coverings using same room designations indicated on Drawings.

E. Product certificates signed by manufacturers of wall coverings certifying that their products comply with specified requirements.

F. Maintenance data for wall covering to include in the operation and maintenance manual specified in Division 1.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed 5 projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fire-Test-Response Characteristics: Provide wall coverings with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

C. Mockups: Prior to installing wall covering, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as

qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Interior Designer's approval of mockups before start of final unit of Work.
5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

    a. When directed, demolish and remove mockups from Project site.
    b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.4 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install wall covering until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

B. Lighting: Do not install wall covering until a lighting level of not less than 15 foot-candles is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Rolls of Wall Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated into the Work include, but are not limited to the following:

1. Innovations Wallcovering (Basis of Design for VWC-1)
2. National Wallcovering (Basis of Design for WB-1)
3. Koroseal Interior Products
4. Architect approved equal.

2.2 PRODUCTS:

A. Vinyl Wallcovering (VWC-1)

1. General: Provide integrally pigmented, opaque virgin vinyl calendered film vinyl wallcovering material treated with mildew and antimicrobial additives and laminated to suitable backing. Comply with FS CCC-W-408A & CFFA-W-101A for types required.
2. Durability: Type II
3. Total Weight: 20 oz. / linear yard
4. Composition: Vinyl
5. Backing: Non-woven
6. Repeat: Non-match
7. Width of Goods: 54” (137 cm)

B. Write Board Wallcovering (WB-1)

1. General: Provide magnetic receptive dry erase wallcovering featuring low glare finish suited for dry erase, projection and magnetic attachment.
2. Durability: 20,000 Double Rubs
3. Total Weight: 0.95 oz / sq. yd.
4. Composition: Polyester facing (does not ghost)
5. Backing: 100% Cellulose (1.25 oz / sq. yd.)
6. Width of Goods: 48”
7. Trim: Snap-on trim (Product Code# WWSOT) at vertical edges floor to ceiling

C. ACCESSORY ITEMS:

1. Adhesive: Provide manufacturer's recommended adhesive, primer, and sealer, produced expressly for use with selected wallcovering on substrate as shown on drawings.
2. Release Coat: Oil base sealer or enamel undercoater for virgin drywall substrates as recommended by wallcovering manufacturer.
3. Metal Molding: Provide molding manufactured expressly for use with wallcoverings, of 6063 aluminum alloy, with fine satin mechanical finish and clear anodic coating complying with AA-M21A31; provide one-piece cap strip type with wall flange tapering to feather-edge.
   a) Adhesive for Molding: Provide contact adhesive recommended by molding manufacturer.
4. Write Board Accessories:
   a) Starter Kit: spray cleaner, erasers, dry erase markers
   b) Snap-On Trim for Wallcovering: Clear satin anodized aluminum finish
   c) Magnets: Magnetic caddy for accessories, magnets for paper announcements (aluminum finish)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for moisture content and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.

C. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
   1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
   2. Metals: If not factory primed, clean and apply rust-inhibitive zinc primer.
   3. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
   4. Prime new gypsum board with primer recommended by wall covering manufacturer.
   5. Allow new plaster to cure. Treat areas of high alkalinity.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

E. Install wall liner, with no gaps or overlaps, where required by wall covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall covering installation until wall liner has dried.

F. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

A. General: Comply with wall coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Cut wall covering panels in roll number sequence. Change run numbers at partition breaks and corners only.

C. Install wall covering with no gaps or overlaps.

D. Match pattern 72 inches above finish floor.

E. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners. No horizontal seams.

F. Remove air bubbles, wrinkles, blisters, and other defects.

G. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Butt seams.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended by wall covering manufacturer.

C. Replace strips that cannot be cleaned.

END OF SECTION 09 95 00

SECTION 10 14 00

INTERIOR SIGNAGE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.

1.02 DESCRIPTION

A. This Section includes the following:
   1. Manufacturer standard signage.
   2. Custom Signage.
   3. Cast Building plaque.
   4. Vinyl Graphics

1.03 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
   1. Georgia Accessibility Code- 2010 Department of Justice ADA Standards for Accessible Design

1.04 QUALITY ASSURANCE

A. Quality of materials and installation to meet acceptable industry standards.

B. Confirm sign text with Architect via approved message schedule prior to manufacture.

C. Thermal deformations: Design, fabricate and install component parts to provide for expansion and contraction over a temperature range for the material of 150 degrees Fahrenheit (65.5 degrees Celsius), without buckling, oil canning, sealant joint failure, glass breakage, undue stress on members or anchors, and other detrimental effects.

D. Wind load: Exterior signs shall be designed to withstand wind pressure loading of 30 PSF and meet or exceed all applicable codes, whichever is greater.

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Final Art:
   1. Included in this contract, Signage contractor is to provide the creation of ALL final art files necessary for the production of the graphics. Signage contractor will be provided graphics layouts indicating design intent in low resolution Adobe PDF format. These PDF's will serve as the design basis to be replicated by the signage contractor in the development of the final art files. Signage contractor is to create all necessary files needed for production including modifications of all text, sizes and layouts. Signage contractor must provide all graphics to the Architect for approval prior to manufacturing. It will be the responsibility of the Signage contractor to make all necessary modifications of all files in order to receive approval from the Architect for production.

C. Product Data:
   1. Submit manufacturer's construction details relative to materials, dimensions of individual component, profiles and finishes for each type of sign, including methodologies, materials and fasteners for installation of each type of sign.

D. Quality Control Submittals:
   1. Provide scaled shop Drawings for approval of each type sign prior to manufacture, indicating sizes, materials, finishes, text/graphics for each sign of each type with installation details.
   2. Provide substrate material, vinyl, inkjet and paint color swatches for verification and approval prior to manufacture.

E. Contract Closeout Information:
   1. Maintenance data.
   2. Warranty: Executed warranty indicated below.

1.06 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop Drawings and fabrication to ensure proper fitting and mounting when possible.

B. Deliver signs for interior installation only after designated areas are ready to receive work. Pack signage components to prevent damage.

C. Store materials in secure areas, out of weather and protected from work of other trades.

1.07 WARRANTY

A. The Contractor assumes overall responsibility, as a part of his warranty of the work to assure that all assembled components and parts shown or required within the work of this Project comply with the Contract Documents. The Contractor shall further warrant:
   1. That all components specified, or required, to satisfactorily complete the installation, are compatible with each other and with the conditions of installation and expected use.
   2. The overall effective integration and correctness of individual parts and the whole of the system.
   3. Compatibility with adjoining substrate, materials and work by other trades.
   4. There shall be no premature material failure due to improper design or fabrication of the system. All materials shall fully perform to their normal life expectancy.
   5. Upon final completion, the Contractor will warrant all work and materials to be in full and complete accordance with the Contracts Documents and agreement between Owner and Contractor, and requirements appertaining thereto; that all work and materials are free from any and all defects and imperfections, and fully meet the manufacturer's published performance criteria for the use and purposes for which each and every part is specified.
   6. The Contractor also agrees that, should any defect develop or appear, which the Architect's Graphic Designer and/or Owner finds was not caused by improper use, the Contractor shall promptly, upon demand, fully correct, substitute and make good any such defective material without any cost to the Owner and will save the Owner harmless against any claim, demand, loss or damage by reason of any breach of this warranty.
   7. The period of this warranty shall commence on the date on which the Contractor has met all Final Completion requirements. The period of said warranty shall last twelve (12) months unless otherwise specified.

B. All paints used must retain a minimum ten (10) year warranty for interior signage. This includes no cracking, flaking, and fading. Exterior paints shall be automotive paint, 2-part catalyst hardened urethane, base coat, top coat, unless otherwise specified.

PART 2 – PRODUCTS

2.01 MANUFACTURERS / MATERIALS

A. Acceptable Manufacturers: The following is a list of acceptable manufacturers:
1. Henry Graphics, Inc., Contact: Kim Whiting (404) 443-4788
2. Takeform Architectural Graphics, Ken Erdoes - 404-367-0400
3. Or Architect approved equal.
4. Other manufacturers desiring approval must comply with Specification Section 01 63 00 Product Substitution Procedures.

B. Refer to this Specification and Drawings for sign types.

C. Sign Construction: Production/manufacture of signs shall include no visible seams (fill, grind, smooth, finish).

D. Acrylic: Provide acrylic plastics equivalent to “Plexiglas” manufactured by Rohm and Haas Company, in sizes as shown. Provide colors as shown.

E. Vinyl: All vinyl to be 3M scotchcal series opaque or reflective vinyl mounted first surface per the Drawings and Specification.

F. Aluminum: Aluminum used for exposed exterior elements shall be T-5 mill aluminum with acrylic polyurethane two-part catalyzed coating system. All coating applications shall be prepared and spray applied in the factory by skilled mechanics. All surfaces shall be mechanically sanded removing all grain lines, striations, and surface blemishes, cleaned with non-abrasive scouring pads, rinsed, and air dried prior to receiving coatings.
1. Coating shall be prepared as designated by manufactures latest literature for surface preparation and application but in no case less than one (1) applicable primer coat and two (2) final full coats. All finished surfaces shall be uniform.
2. Colors shall match color designations as indicated on the Drawings.

G. Miscellaneous Products:
1. Coatings:
All surfaces shall be prepared to receive coatings or surface finishes according to manufactures’ latest for surface preparation and application but in no case less than one (1) applicable primer coat and two (2) final full coats. All finished surfaces shall be uniform.
2. Foam Tape:
1/32” (0.88 mm) thick, doubled faced, white pressure sensitive urethane foam adhesive tape, one (1) of the following:
a. 3M Company: No. 4032 or AL4432YEAom9576
b. Spectape of Texas: No. ST1132
3. Silicone:
FS TT-S-001543, Class A, one (1) of the following:
a. General Electric: Silicone Sealant #1200
b. Dow Corning: Building Sealant #781
4. Epoxy:
Two (1) component thermosetting epoxy adhesive with 100% solids content, one (1) of the following:
a. Miracle Adhesive: No. NP-428

b. Hughson Chemicals Chemlok #304

H. Fire Badge for custom signage to be made from stamped metal or cast aluminum with an applied painted finish as called for, to provide a three-dimensional result.

2.02 INTERIOR SIGNAGE FABRICATION

A. Shop fabrication and tolerances shall conform to the standards of the industry. All items shall be shop fabricated so far as practicable. Perform high-quality, professional workmanship. Attach materials with sufficient strength, number and spacing not to fail until materials joined are broken or permanently deformed. Fabricated all work to be truly straight, plumb, level and square and to sizes, shapes and profiles indicated on the approved shop Drawings

B. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. All welding procedures shall conform to applicable AWS specifications. All welds shall develop capacity of members being joined unless specified length or extent is noted on the Drawings. Type of alloy filler metal and electrodes to be that which is recommended by producer of the metal to be welded, and as required for color match, strength, and compatibility in the fabricated items.

D. Panels shall show no visual distortion when viewed in installation position. All panel faces shall be as such flatness that when measured, the maximum slope of the surface at point, measured from the nominal plane of the surface, shall not exceed 1.0%. Any panel not meeting these requirements is subject to rejection by the Architect.

2.03 INTERIOR SIGNAGE APPLIED TO GLAZING AT MAIN ENTRY DOORS

A. Interior Graphic Applied to Glazing at Entry:
1. Graphics material: 2 mil cast vinyl film applied to conditioned side of glazing system.
a. Internationally recognized “No Smoking” graphic in radius.
1) Height: 4”.
2) Finish: white and red-opaque.
3) Mounting method: Pressure sensitive adhesive.
b. Include 150 characters to be applied to conditioned side of glazing system.
1) Height to be determined.
2) Verbiage to be determined.
3) Finish: opaque-color to be determined.
4) Mounting method: Pressure sensitive adhesive.

2.04 INTERIOR SIGNAGE APPLIED TO INTERIOR DOORS

A. Interior Graphic Applied to Interior Doors
1. Graphics material: 2 mil cast vinyl film applied to outside of door per drawing details
a. Verbiage per Signage Detail drawing sheet
1) Height: 18”
2) Finish: To match Sherwin Williams SW0055 Light French Gray
3) Mounting method: Pressure sensitive adhesive

2. Final Graphics and text shall be provided to the Contractor during the submittal process.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine substrate and conditions which signage is to be mounted to.

B. Verify substrates are clean, free from moisture, or materials which may affect adhesion.

C. Carefully examine surfaces for defects and irregularities.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

E. Installation indicates acceptance of substrates and responsibility for performance.

3.02 INSTALLATION

A. Do not start until work of other trades are complete.

B. Coordinate with other wall and ceiling work.

C. Obtain all necessary permits and approvals prior to fabricating or installing signs.

D. Install signs using specified method and materials, level, plumb and true to line at locations and heights specified above, shown on the Drawings or as directed by Architect. Coordinate and confirm installation locations with Architect, including preferred installation methods depending on locations specified in Construction Documents per sign type.

E. All signs to be installed per ADA guidelines.
   1. Install signs at 5’-0” AFF to centerline of sign on latch side of door wherever possible and unless noted otherwise.

F. Furnish inserts and anchoring devices which must be set in concrete or built into masonry, if required, for installation of this work. Provide setting Drawings, templates, instructions and directions for installation of anchorage devices. Provide toothed steeled or lead shield expansion bolt devices for drilled-in-place anchors and inserts for exterior installation. Provide units with exposed surfaces matching the texture and finish of metal item anchored.

3.03 ADJUST AND CLEAN

A. Repair or replace and damaged work prior to date of Substantial Completion.

B. Cover or otherwise protect with non-staining building paper or as may be necessary to prevent dirt and damage.

3.04 SIGNAGE SCHEDULE

A. Refer to Drawings for signage types and locations.

END OF SECTION 10 14 00

SECTION 10 14 14

EXTERIOR SIGNAGE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.

1.02 DESCRIPTION

A. This Section includes the following:
   1. Manufacturer standard signage.
   2. Custom Signage.
   3. Cast Building plaque.

1.03 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
   1. Georgia Accessibility Code- 2010 Department of Justice ADA Standards for Accessible Design

1.04 QUALITY ASSURANCE

A. Quality of materials and installation to meet acceptable industry standards.

B. Confirm sign text with Architect via approved message schedule prior to manufacture.

C. Thermal deformations: Design, fabricate and install component parts to provide for expansion and contraction over a temperature range for the material of 150 degrees Fahrenheit (65.5 degrees Celsius), without buckling, oil canning, sealant joint failure, glass breakage, undue stress on members or anchors, and other detrimental effects.

D. Wind load: Exterior signs shall be designed to withstand wind pressure loading of 30 PSF and meet or exceed all applicable codes, whichever is greater.

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Final Art:
   1. Included in this contract, Signage contractor is to provide the creation of ALL final art files necessary for the production of the graphics. Signage contractor will be provided graphics layouts indicating design intent in low resolution Adobe PDF format. These PDF's will serve as the design basis to be replicated by the signage contractor in the development of the final art files. Signage contractor is to create all necessary files needed for production including modifications of all text, sizes and layouts. Signage contractor must provide all graphics to the Architect for approval prior to manufacturing. It will be the responsibility of the Signage contractor to make all necessary modifications of all files in order to receive approval from the Architect for production.

C. Product Data:

1. Submit manufacturer's construction details relative to materials, dimensions of individual component, profiles and finishes for each type of sign, including methodologies, materials and fasteners for installation of each type of sign.

D. Quality Control Submittals:
   1. Provide scaled shop Drawings for approval of each type sign prior to manufacture, indicating sizes, materials, finishes, text/graphics for each sign of each type with installation details.
   2. Provide substrate material, vinyl, inkjet and paint color swatches for verification and approval prior to manufacture.

E. Contract Closeout Information:
   1. Maintenance data.
   2. Warranty: Executed warranty indicated below.

1.06 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop Drawings and fabrication to ensure proper fitting and mounting when possible.

B. Deliver signs for interior installation only after designated areas are ready to receive work. Pack signage components to prevent damage.

C. Store materials in secure areas, out of weather and protected from work of other trades.

1.07 WARRANTY

A. The Contractor assumes overall responsibility, as a part of his warranty of the work to assure that all assembled components and parts shown or required within the work of this Project comply with the Contract Documents. The Contractor shall further warrant:
   1. That all components specified, or required, to satisfactorily complete the installation, are compatible with each other and with the conditions of installation and expected use.
   2. The overall effective integration and correctness of individual parts and the whole of the system.
   3. Compatibility with adjoining substrate, materials and work by other trades.
   4. There shall be no premature material failure due to improper design or fabrication of the system. All materials shall fully perform to their normal life expectancy.
   5. Upon final completion, the Contractor will warrant all work and materials to be in full and complete accordance with the Contracts Documents and agreement between Owner and Contractor, and requirements appertaining thereto; that all work and materials are free from any and all defects and imperfections, and fully meet the manufacturer's published performance criteria for the use and purposes for which each and every part is specified.
   6. The Contractor also agrees that, should any defect develop or appear, which the Architect's Graphic Designer and/or Owner finds was not caused by improper use, the Contractor shall promptly, upon demand, fully correct, substitute and make good any such defective material without any cost to the Owner and will save the Owner harmless against any claim, demand, loss or damage by reason of any breach of this warranty.
   7. The period of this warranty shall commence on the date on which the Contractor has met all Final Completion requirements. The period of said warranty shall last twelve (12) months unless otherwise specified.

B. All paints used must retain a minimum ten (10) year warranty for interior signage. This includes no cracking, flaking, and fading. Exterior paints shall be automotive paint, 2-part catalyst hardened urethane, base coat, top coat, unless otherwise specified.

PART 2 – PRODUCTS

2.01 MANUFACTURERS / MATERIALS

A. Acceptable Manufacturers: The following is a list of acceptable manufacturers:
   1. Henry Graphics, Inc., Contact: Kim Whiting (404) 443-4788
   2. Takeform Architectural Graphics, Ken Erdoes - 404-367-0400
   3. Or Architect approved equal.
   4. Other manufacturers desiring approval must comply with Specification Section 01 63 00 Product Substitution Procedures.

B. Refer to this Specification and Drawings for sign types.

C. Sign Construction: Production/manufacture of signs shall include no visible seams (fill, grind, smooth, finish).

D. Acrylic: Provide acrylic plastics equivalent to “Plexiglas” manufactured by Rohm and Haas Company, in sizes as shown. Provide colors as shown.

E. Vinyl: All vinyl to be 3M scotchcal series opaque or reflective vinyl mounted first surface per the Drawings and Specification.

F. Aluminum: Aluminum used for exposed exterior elements shall be T-5 mill aluminum with acrylic polyurethane two-part catalyzed coating system. All coating applications shall be prepared and spray applied in the factory by skilled mechanics. All surfaces shall be mechanically sanded removing all grain lines, striations, and surface blemishes, cleaned with non-abrasive scouring pads, rinsed, and air dried prior to receiving coatings.
   1. Coating shall be prepared as designated by manufactures latest literature for surface preparation and application but in no case less than one (1) applicable primer coat and two (2) final full coats. All finished surfaces shall be uniform.
   2. Colors shall match color designations as indicated on the Drawings.

G. Miscellaneous Products:
   1. Coatings:
      All surfaces shall be prepared to receive coatings or surface finishes according to manufactures’ latest for surface preparation and application but in no case less than one (1) applicable primer coat and two (2) final full coats. All finished surfaces shall be uniform.
   2. Foam Tape:
      1/32” (0.88 mm) thick, doubled faced, white pressure sensitive urethane foam adhesive tape, one (1) of the following:
      a. 3M Company: No. 4032 or AL4432YEAom9576
      b. Spectape of Texas: No. ST1132
   3. Silicone:
      FS TT-S-001543, Class A, one (1) of the following:
      a. General Electric: Silicone Sealant #1200
      b. Dow Corning: Building Sealant #781
   4. Epoxy:
      Two (1) component thermosetting epoxy adhesive with 100% solids content, one (1) of the following:
      a. Miracle Adhesive: No. NP-428
      b. Hughson Chemicals Chemlok #304

H. Fire and Police Badge for custom signage to be made from stamped metal or cast aluminum with an applied painted finish as called for, to provide a three-dimensional result.

2.04 CAST BUILDING DEDICATION PLAQUE

A. 26” x 26” Cast Aluminum with dark, pebble textured background.

B. Raised lettering/graphics and single line raised border.

C. Wall mounted with concealed mounting on interior wall near main entry door. Final location shall be provided to the Contractor during the submittal process.

D. Final Graphics and text shall be provided to the Contractor during the submittal process.

2.05 ARCHITECTURAL DIMENSIONAL LETTERS AND EMBLEMS

A. Refer to Architectural Drawings, exterior building elevations for location and size of dimensional letters.

B. Refer to Architectural Drawings for location of emblems. Approximate size of emblems is 60” diameter. Owner provided graphics and colors shall be determined at a later date.

C. Provide individual prismatic cast aluminum letters with protective coating. Provide three-dimensional/painted emblems, finished per Owner’s design.

D. Individual characters to receive threaded studs for mounting. Studs to be set in holes drilled in exterior wall and secured in epoxy grout.

E. Contractor to field verify all conditions and dimensions prior to submitting detailed shop Drawings.

2.06 FABRICATED SITE SIGNAGE

A. Refer to Architectural Drawings for sizes and appearance. Refer to Civil Drawings for locations.

2.07 JOB SITE SIGN

A. A two sided, 4’x 8’ color job site sign mounted on 4”x4” posts is required for this Project, location to be determined. The top of the sign shall be 8’ above finished grade and posts shall be set in quick-rete. Sign shall be removed at the end of the last phase of the work as directed by the Architect. Final high resolution graphic will be provided by the Owner. A shop Drawing shall be submitted prior to fabrication to the Architect.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine substrate and conditions which signage is to be mounted to.

B. Verify substrates are clean, free from moisture, or materials which may affect adhesion.

C. Carefully examine surfaces for defects and irregularities.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

E. Installation indicates acceptance of substrates and responsibility for performance.

3.02 INSTALLATION

A. Do not start until work of other trades are complete.

B. Coordinate with other wall and ceiling work.

C. Obtain all necessary permits and approvals prior to fabricating or installing signs.

D. Install signs using specified method and materials, level, plumb and true to line at locations and heights specified above, shown on the Drawings or as directed by Architect. Coordinate and confirm installation locations with Architect, including preferred installation methods depending on locations specified in Construction Documents per sign type.

E. Furnish inserts and anchoring devices which must be set in concrete or built into masonry, if required, for installation of this work. Provide setting Drawings, templates, instructions and directions for installation of anchorage devices. Provide toothed steeled or lead shield expansion bolt devices for drilled-in-place anchors and inserts for exterior installation. Provide units with exposed surfaces matching the texture and finish of metal item anchored.

3.03 ADJUST AND CLEAN

A. Repair or replace and damaged work prior to date of Substantial Completion.

B. Cover or otherwise protect with non-staining building paper or as may be necessary to prevent dirt and damage.

3.04 SIGNAGE SCHEDULE

A. Refer to Drawings for signage types and locations.

END OF SECTION 10 14 00

SECTION 10 26 13

CORNER GUARDS

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This Section includes the following:

1. Stainless Steel Corner guard system for wall protection

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. National Fire Protection Association (NFPA)

C. Underwriters Laboratory (UL)

D. Uniform Building Code (UBC)

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide corner guards that conform to the following requirements of regulatory agencies.

1. Fire Performance Characteristics: Provide UL Classified corner guards conforming with NFPA Class A fire rating. Surface burning characteristics, as determined by UL-723 (ASTM E-84), shall be flame spread of 10 and smoke development of 350 - 450.
2. Self Extinguishing: Provide corner guards with a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988.

1.4 SUBMITTALS

A. Product Data: Manufacturer’s printed product data for each type of corner guard specified.

B. Detail Drawings: Mounting details and instructions for specific project substrates.

C. Samples: Verification samples of corner guard, 6" (203mm) long, in full size profile of each type indicated.

D. Manufacturer’s Installation Instruction: Printed installation instructions for each guard.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened factory packaging to the jobsite

B. Inspect materials at delivery to assure that specified products have been received.

C. Store in original packaging in a climate controlled location away from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Requirements: Products must be installed in an interior climate controlled environment.

1.7 WARRANTY

A. Provide Manufacturer's Limited Lifetime Warranty against material and manufacturing defects and a one-year warranty on installation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturer: the following is a list of acceptable manufacturers:

1. Korogard www.korogard.com
2. InPro Corporation/ IPC Door and Wall Protection Systems
3. Or Architect Approved Equal

B. Provide all corner guards and wall protection from a single source.

2.2 MANUFACTURED UNITS

A. Corner Guard

1. Specifications based on IPC Surface Mount Stainless Steel Corner Guard Corner Guard:
   a. CG-1: 1 ½" x 1 ½" x 48", 1/8" radius, Cement-on, 430 Stainless steel, 16 gauge

2.3 MATERIALS

A. Stainless Steel: Wall Guard shall be manufactured from type 430 Stainless Steel.

B. Provide rounded top edge as indicated on Drawings.

2.4 COMPONENTS

A. Attachment:

1. Adhesive: Field applied heavy duty adhesive

2.5 FINISHES

A. Stainless Steel: Stainless steel wall guard shall have a #4 satin finish.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions in which the corner and wall guard systems will be installed.

1. Complete all finishing operations, including painting, before beginning installation of corner and guard system materials.

B. Wall surface shall be dry and free from dirt, grease and loose paint.

3.2 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.3 INSTALLATION

A. General: Locate corner and wall guards as indicated on the approved detail Drawings for the appropriate substrate. Install corner guard level and plumb at the height indicated on Drawings.

B. Installation of Stainless Steel Corner Guards:

1. Refer to manufacture's instruction for installation based on the surface that the corner guard is mounted on.

2. Install corner guard level and plumb at the height indicated on the Drawings.
   a. Surface must be dry, clean and properly sealed.

3. Cement on: Apply a bead of PL Premium Heavy Duty Adhesive in a zigzag pattern over the back of each wing of the corner guard. Position corner guard on the wall and apply pressure until a tight fit is achieved.

4. Remove the protective plastic covering from the exposed surface of the corner guard.

3.4 CLEANING

A. At completion of the installation, clean surfaces in accordance with the manufacturer's clean-up and maintenance instructions.

END OF SECTION 10 26 13

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Toilet, bath, washroom, and custodial accessories

B. Attachment hardware

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Installation of concealed anchor devices

B. Installation of backing plate reinforcement

1.03 RELATED SECTION

A. Division 10 Section “Toilet Compartments” for attachment of accessories to solid plastic toilet compartments.

B. In-wall framing and plates and above ceiling framing for support of accessories.

1.04 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People

B. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips

C. ANSI/ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality

D. ANSI/ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products

E. ANSI/ASTM B456 - Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

F. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

G. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service

H. NEMA LD-3 - High Pressure Decorative Laminates

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submittals shall provide product data on accessories describing size, finish, details of function, attachment methods.

C. Submit manufacturer's installation instructions.

1.06 KEYING

A. All accessories shall be keyed alike.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with ANSI A117.1.

B. Operation of accessories shall comply with guidelines set forth by the American Disabilities Act, Title III. Documentation and samples to be provided to Architect upon request.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the placement of internal wall reinforcement to receive anchor attachments.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Model numbers for toilet room accessories manufactured by Bradley Corporation are listed to establish a standard of quality for design, function, materials, workmanship and appearance. Others approved include A & J, Bobrick, Palmer Fixture Company. Manufacturers may be submitted for evaluation by the Architect by following the conditions of the substitutions clause. The Architect shall be the sole judge as to the acceptability of all products submitted for substitution.

B. Refer to Drawings for toilet room accessory locations.

2.02 SOURCE

A. Accessories shall be the products of a single manufacturer. Accessories with tumbler locks shall be keyed alike with the exception of coin boxes in vending equipment.

2.03 MATERIALS

A. Stainless Steel: ANSI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Sheet Steel: Cold-rolled, commercial quality ASTM A366, 20-gauge minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

C. Fasteners: Screws, bolts, and other devices of same materials as accessory unit or of galvanized steel where concealed.

2.04 PRODUCTS

A. Mirror:
   1. Basis-of-Design Product: Bradley Model #747F-024360S.
   2. Frame: Integral frosted glass.
   3. Size: 24” x 36”.
   4. Mounting: As indicated by manufacturer.

B. Liquid Soap Dispenser:
   1. Basis of Design Product: Bradley Model #6A01-11
   2. Mounting: Surface
   3. Provide Bradley Soap Dish #9014-63 mounted below dispenser, 4’-6” A.F.F. if soap is not mounted over a counter top.

C. Toilet Tissue Dispenser:
   1. Basis-of-Design Product: Bradley Model #5263.
   2. Mounting: Surface mounted.

D. 36” Grab Bar:
   1. Basis-of-Design Product: Bradley Model #812-001-36-2.
   2. Mounting: Flanges with concealed fasteners.

E. 42” Grab Bar:
   1. Basis-of-Design Product: Bradley Model #812-001-42-2.
   2. Mounting: Flanges with concealed fasteners.

F. Towel Dispenser/Waste Receptacle:
   1. Basis-of-Design Product Bradley model #2A05-10
   2. Mounting: Semi-recessed
   3. Provide vinyl liner part #P11-044

G. Towel Hook:
   1. Basis-of-Design Product: Bradley #9124-US
   2. Mounting: Surface Mounted

H. ADA Shower Seat:
   1. Basis-of-Design Product: Bradley Model #9569
   2. Mounting: Surface Mounted

I. Not Used

J. Shower Curtain Assembly:
   1. Basis-of-Design Product:
      a. Curtain Rod: Bradley Model #9539
      b. Curtain: Bradley Model #9533
      c. Curtain Hooks with rollers: Bradley Model #9540
   2. Mounting: Surface Mounted

K. Showerr Controls – Refer to Plumbing

L. Shower Grab Bar:
   1. Basis-of-Design Product: Bradley #800 Shower Configuration 36(RH) or 37(LH)
   2. Mounting: Surface mounted per ADA guidelines

M. Not Used

N. Bench:
   1. Basis-of-Design Product: Bradley 9562
   2. Mounting: Surface mounted

2.05 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout Project.

B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Fabricate units of all welded construction with mitered corners. Hinge doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions, and as per ANSI 117.1.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.04 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing labels and protective coating.

END OF SECTION 10 28 13

SECTION 10 44 00

FIRE EXTINGUISHERS AND CABINETS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Fire extinguisher brackets.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for verification purposes in full-size units of each type of cabinet finish indicated, and in sets for each color, texture, and pattern specified, showing the full range of variations.

D. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

E. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

D. Conform to NFPA 10 requirements for portable fire extinguishers.

E. Conform to Americans with Disabilities Act 1990 on maximum cabinet projection of 4” in corridors where necessary and 48” high from finish floor to lever.

1.05 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   i. Failure of hydrostatic test according to NFPA 10.
   ii. Faulty operation of valves or release levers.
2. Warranty Period: 6 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Larsen's Manufacturing Company (Basis of Design).
2. J. L. Industries, Inc., a division of Activar Construction Products Group.
3. Architect approved equal prior to bid.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: MP Series - UL-rated 4A -80BC, 10-lb nominal capacity, in enameled steel container.

C. Wet Chemical Type: WC Series - UL-rated 2A:K, 2.5-gal. nominal capacity, in stainless steel container.

2.03 CABINETS

A. Fire-Rated Cabinets: Provide UL listed cabinets with UL listing mark for all fire-rated wall.

B. Cabinet Type: Suitable for containing the following:

1. Fire extinguisher.

C. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed

cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   a. Rounded-edge trim with 5/16-inch backbend depth.
   b. Trim Metal: Stainless Steel.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Stainless Steel: Manufacturer's standard door construction.

F. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.

1. Application Process: Silk screen.

G. Door Style: Manufacturer's standard design.

1. Silk-screen lettering or design.
2. Full Clear Acrylic door.

H. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

I. Finishes for Cabinet:

1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
2. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.04 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine rough-in for hose vales, hose racks, and cabinets to verify locations of piping connections prior to cabinet installation.

B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10 44 00

SECTION 10 56 13

METAL SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Double Rivet Metal Storage Shelving for Records Storage

1.3 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Samples for Initial Selection: For units with factory-applied color finishes. Include similar Samples of accessories involving color selection.

C. Samples for Verification: For the following components, of size indicated below:

1. Vertical end panels and posts: 12 inches (305 mm) tall.
2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep (610 mm wide by 305 mm deep).
3. Connectors for Shelf to End Panel, Shelf to Post, Beam to Post: Full size.

D. Product Certificates: For each type of metal storage shelving from manufacturer.

PART 2 - PRODUCTS

2.1 DOUBLE RIVET POST AND BEAM METAL STORAGE SHELVING

A. General: Factory-formed, field-assembled, freestanding, post-and-beam metal storage shelving system, designed for shelves to be supported by beams that span between and are supported by corner posts, with beams adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units as add-on units, designed to share two corner posts with initial shelving unit. Provide fixed top and bottom beams, adjustable intermediate beams, and accessories indicated.

1. Manufacturers: Subject to compliance with requirements:

2. Basis-of-Design Product: Subject to compliance with requirements, provide shelving units in the configurations shown on the drawings using "Rivit-Rite" records storage shelving by Penco Products, Inc. or comparable product by one of the following:

   a. Penco Products (Basis of Design)
   b. Hallowell; a division of List Industries, Inc.
   c. Tennsco.

B. Load-Carrying Capacity per Shelf: 600 lbs.

C. Posts: Fabricated from cold-rolled steel; in manufacturer's standard angle shape with perforations at 1-1/2 inches (38 mm) o.c. to receive beam-to-post connectors

1. Steel Thickness, Nominal: As required for load-carrying capacity per shelf and number of shelves, but not less than 0.75 inch (1.9mm)
2. Add-On Shelf Posts: Fabricated from hot-rolled steel, tee shape; perforated to match main posts and of same thickness.
3. Post Base: Cold-rolled steel floor plate, drilled for floor anchors.

D. Beams: Fabricated from cold-rolled steel; in manufacturer's standard shape; with projecting manufacturer's standard beam-to-post connectors at each end designed to engage posts. Provide beam at each side of each shelf, with center supports.

1. Steel Thickness, Nominal: As required for load-carrying capacity per shelf but not less than 0.75 inch (1.9mm)
2. Beam-to-Post Connectors: Provide top, bottom, and intermediate shelf beams with double beam-to-post connectors.
3. Beam Quantity: Provide beams for the number of shelves as indicated on the Drawings, including bottom shelf.

E. Steel Shelving: Heavy Duty Steel shelving

1. Steel Sheet Thickness, Nominal: As required for load-carrying capacity per shelf
2. Fabricate fronts, backs, and sides of shelves with box-formed edges not less than 1-1/4". Faces and corners lapped and welded.

F. Shelf Quantity: Six (6) per unit, including top and bottom

SHELVING UNIT 1 – New shelving unit –

Provide (4) at Storage 141A Refer to drawings

1. Overall Unit Width: 36"
2. Overall Unit Depth: 18"
3. Overall Unit Height: 72"

G. Steel Finish: Baked enamel

1. Color and Gloss: Putty, Semi-Gloss

2.2 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating.

D. Floor Anchors: Galvanized-steel, power-actuated fasteners. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.

E. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.3 FABRICATION

A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate metal storage shelving square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
3. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
4. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

C. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form backs of shelving units up to 48 inches (1219 mm) wide from one piece.

D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch- (13-mm-) wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.

E. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 METALLIC-COATED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780/A780M.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

2.6 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling."

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and vacuum finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
3. Adjust post-base bolt leveler to achieve level and plumb installation.

4. Connect side-to-side and back-to-back shelving units together.
5. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.

    a. Post-and-Beam Metal Storage Shelving: Install beams with beam-to-post connectors fully engaged in post perforations.

B. Accessories:

1. Install weight limitation signage to face of shelving units. Refer to Signage Specification.

3.4 ERECTION TOLERANCES

A. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch (6 mm) in 84 inches (2134 mm) of height.

3.5 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13

SECTION 10 56 23

WIRE SHELVING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers coat and hat racks as indicated on the Drawings and as specified herein. This section covers all labor, material, accessories and appliances necessary for the complete installation of coat and hat racks. Items not specifically mentioned herein or on the Drawings which are clearly necessary to make a complete installation shall also be included.

B. Related Work Specified Elsewhere:

1. Related Division 6 “Rough Carpentry” for wood blocking

PART 2 – PROJECTS

2.01 MATERIALS

A. Shelves:

1. Shelves shall be CLOSETMAID Max Load Wire Shelving vinyl coated, steel rod, ventilated shelving as manufactured by Clairson International, Ocala, FL. Shelves shall be adjustable.
2. Color shall be manufacturer’s standard charcoal grey.
3. Product Information:
   CLOSETMAID Products:
   a. Shelving: 16” Max Load shelving 4’ or 6’ long (Charcoal Grey)
   b. Mounting Track: Max Load Standard 48” or 84” long (Hammertone)
   c. Brackets: Max Load Bracket for 16” shelving (Hammertone)

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. Install units in accordance with manufacturer's printed instructions. Finished Work shall be plumb, level, rigid, and in perfect alignment as required.
2. Any damaged finishes shall be repaired to the Architects satisfaction or replaced.

END OF SECTION 10 56 23

SECTION 10 73 16

PRE-ENGINEERED ALUMINUM CANOPIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, shall apply to work specified in this Section.

1.02 DECRIPTION OF WORK

A. Work in this section shall include design, fabrication and installation of complete welded, extruded aluminum. All work shall be in complete accordance with the Drawings and this Specification.

1.03 REFERENCES

A. Aluminum Design Manual, Latest Edition, Specifications & Guidelines for Aluminum Structures.

B. ASCE 7, Minimum Design Loads for Buildings and Other Structures

C. American Architectural Manufacturers Association (AAMA)

D. American Society for Testing and Materials (ASTM)

1.04 RELATED SECTIONS

A. Division 3, Section “Cast-in-Place Concrete”

B. Division 5, Section “Structural Steel”

C. Division 7, Section “Sheet Metal Flashing and Trim”

D. Division 7, Section “Joint Sealants”

1.05 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.

C. Shop Drawings: Submit complete shop Drawings stamped and signed by Contractor’s registered Structural Engineer, licensed in the State of Georgia. Shop Drawings shall include all necessary plan dimensions, elevations, details, and reactions at support points. The Contractor shall verify all dimensions and provide elevations at each column, finish floor, and related soffit or adjacent work before releasing to manufacturer for fabrication. **Fabrication shall not proceed without the approved shop Drawings**.

D. Certification: Submit design calculations stamped and signed by Contractor’s registered Structural Engineer, licensed in the State of Georgia. Design calculations shall state that the pre-engineered canopy systems design complies with the minimum loading requirements of ACSE 7-95, International Building Code, current edition and state and local requirements.

E. Samples: Submit a full size corner mockup indicating materials, workmanship, and finish for review and approval.

1.06 QUALITY ASSURANCE

A. Pre-engineered aluminum canopies shall be wholly produced by a recognized manufacturer with at least five (5) years of experience in the design and fabrication of extruded aluminum pre-engineered canopy systems. Components shall be assembled in shop to greatest extent possible to minimize field assembly. All canopies shall be installed by the manufacturer.

1.07 WARRANTIES

A. Pre-engineered aluminum canopy system, including material and workmanship, shall be warranted from defects for a period of one (1) year from Substantial Completion of the Project.

B. Pre-engineered aluminum canopy system finish shall be warranted Type/Term: Provide a 5-year manufacturers finish warranty for the baked enamel finish for the entire canopy system, including all metal, flashing, accessories and rain carrying equipment as supplied by the manufacturer. This warranty shall be for a period of five (5) years from the date of Substantial Completion of the Project and shall cover chalking and fading in accordance with ASTM standards, including the overall integrity of the finish against cracking, checking, peeling or loss of adhesion.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver components other manufactured items so as not to be damaged or deformed. Package for protection during transportation and handling.

B. Unload, store, and erect pre-engineered aluminum canopies in a manner to prevent bending, warping, twisting, and surface damage.

C. Store pre-engineered aluminum canopies covered with suitable weather tight and ventilated covering as recommended by the manufacturer. Store pre-engineered aluminum canopies to ensure dryness, with positive slope for drainage of water. Do not store in contact with other materials that might cause staining, denting, or other surface damage.

1.9 COORDINATION

A. Coordinate assemblies with exterior metal panels, rain drainage work, flashing, trim, and construction of masonry, stud framing**,** and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit.

B. Field Measurements: The Contractor shall verify location and elevation relative to finish floor, columns, windows, and other construction contiguous with pre-engineered aluminum canopies by field measurements before fabrication and indicate measurements on shop Drawings.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain pre-engineered aluminum canopies through one source from a single manufacturer who shall manufacture and install the canopies.

B. Acceptable Manufacturers:

1. Peachtree Protective Covers, Inc.
2. Mitchell Metals, Inc.
3. Pierre Construction, Inc.
4. Tennessee Valley Metals, Inc.

2.02 DESIGN INTENT

A. Pre-engineered aluminum canopies shall be all welded extruded aluminum system complete with internal drainage. Non-welded systems are not acceptable.

B. Roll formed deck is not acceptable. Expansion joints shall be included to accommodate temperature changes and for expansion. Expansion joints shall have no metal to metal contact.

C. The canopy systems shall be wholly designed and engineered by the manufacturer, including all accessories, fastening, and connections, posts, beams, and all other components required for a complete system that will withstand the loading requirements of the applicable codes and design guidelines for the intended canopy system.

2.03 MATERIALS

A. Aluminum Members: All sections shall be extruded aluminum 6063 alloy, heat treated.

B. Fasteners: Fasteners shall be aluminum, 18-8 stainless steel or 300 series stainless steel.

2.04 COMPONENTS

A. Beams: Beams shall be of size, shape, and strength, and designed to receive deck members in self-flashing manner and support structural ties and all related forces.

B. Deck: Deck shall be extruded self-flashing sections interlocking into a composite unit.

C. Fascia: Fascia shall be manufacturer's standard shape. Size as indicated on Drawings.

D. Flashing: Flashing shall be .040 aluminum (min.), pre finished to match canopy.

E. Tie rods: Tie rods shall be 1” diameter

F. Tie rods connection plates: Plates shall be 8” x 8” x 1/2" square aluminum. Provide spacers as required to prevent damage to the exterior veneer of the building at connection points.

G. All thru-wall flashing by Contractor.

2.05 FABRICATION

A. All welds shall be smooth and uniform. Suitable edge preparation shall be performed to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection.

B. Deck Construction: Deck shall be manufactured of extruded modules that interlock in a self-flashing manner. Interlocking joints shall be positively fastened at appropriate intervals to create structural unit capable of developing the full strength of the design. The deck shall be assembled with sufficient camber to offset dead load deflection.

2.06 FINISH

A. Factory Applied Baked Enamel, Color: As selected by Architect from manufacturer's full range of colors or custom color to match storefront window systems.

PART 3 – EXECUTION

3.01 PREPARATION

A. Erection shall be performed after all adjacent work is complete.

3.02 INSTALLATION

A. All canopies are to be installed according to approved shop Drawings.

B. All canopies shall be installed straight, true and plumb according to standard construction practices.

C. All fasteners penetrating the building façade shall be properly sealed against moisture penetration.

D. All blocking should be provided by the Contractor in accordance with the approved shop Drawings.

E. Canopies shall be installed with positive and negative slope of 1/8" per foot to allow water drainage to eliminate ponding.

F. All joints, corners and connections shall be tight and clean.

G. All exposed fasteners shall be prepped and painted to match the color of the canopy.

H. Provide continuous sealant at all penetration and connection points of canopy, tie rods, and tie rod connection plate.

3.03 CLEANING

A. All pre-engineered aluminum canopy components shall be cleaned promptly after installation.

3.04 PROTECTION

A. Care shall be taken to protect materials during and after installation.

END OF SECTION 10 73 16

SECTION 10 75 00

FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ground-set flagpoles made from aluminum.

B. Related Sections include the following:

1. Division 3, Section "Cast-in-Place Concrete" for concrete footings for flagpoles.
2. Division 7, Section "Joint Sealants" for elastomeric sealant filling the top of the foundation tube.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."

1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
2. Basic Wind Speed: 100 mph (45 m/s); 3-second gust speed at 33 feet (10 m) aboveground.

1.4 SUBMITTALS

A. Product Data: For each type of flagpole required.

B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems.

1. Include details of foundation system for ground-set flagpoles.

C. Structural Calculations: For flagpoles indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Finish Samples for Verification: For each finished material used for flagpoles and accessories.

E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1. Obtain flagpoles from a single manufacturer.

SECTION 10 75 00

FLAGPOLES

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Sole source responsibility for the flagpole and all accessories is required. Subject to compliance with requirements, provide products by one of the following:

1. Atlas Flags, Inc. (Basis of Design)
2. American Flagpole; a Kearney-National Inc. Company
3. Concord Industries, Inc.
4. Lingo Inc.; Acme Flagpole Division
5. Pole-Tech Company Inc.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one seamless piece.

B. Exposed Height: Provide one (1) 30’ foot tapered pole.

C. Aluminum Flagpoles: Provide cone-tapered flagpole fabricated from seamless extruded tubing, if available, complying with ASTM B 241/ (B 241M), Alloy 6063-T6, with a minimum wall thickness of 3/16 inch (4.8 mm). Heat treat after fabrication to comply with ASTM B 597, Temper T6. Finish shall be clear anodized aluminum

D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch- (1.6-mm-) minimum nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch (19-mm-) diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.
2. Provide steel ground protectors extending 12 inches (300 mm) aboveground and 6 inches (150 mm) belowground for steel flagpoles where flashing collars are not provided.

E. Sleeve for Aluminum Flagpole: 16 gauge corrugated galvanized foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Provide flashing collar of same material and finish as flagpole.

F. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

1. Provide heavy-duty spun aluminum collar.
2. Provide units made from same metal and with same finish as flagpoles.

2.3 FITTINGS AND ACCESSORIES

A. Finial Ball: Gold Anodized Ball Top

B. Solar Light: LED solar powered light

1. Size: 10” diameter
2. Rating: 100,000 hours
3. Photo Sensor – Dusk to Dawn operation
4. Finial attachment for standard ½ “ ornament spindle

C. Internal Halyard, Cam Cleat System: 5/16-inch- (8-mm-) diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

D. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

E. Cam Cleat: Manually operated cam cleat includes a flush-access door with cylinder lock and continuous piano hinge.

F. Flags: Provide Two (2) 5’x8’ Nylon Flags – One (1) State of Georgia Flag, and One (1) US Flag

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Provide concrete composed of portland cement, coarse and fine aggregate, and water mixed in proportions to attain a 28-day compressive strength of not less than 3000 psi (20 MPa), complying with ASTM C 94/C 94M.

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealant: Multi-component urethane joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (non-traffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Black Anodized Finish: Provide fine, directional, polished satin polish followed by a black anodized finish (per AA-M32 c22A41 Class 1); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use non-staining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate Installation: Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

D. Photo documentation of foundation preparation and reinforcement is required. Contractor shall coordinate all inspections related to the flagpole installation.

END OF SECTION 10 75 00

SECTION 10 82 00

LOUVERS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers exterior (stationary) louvers complete as shown on Drawings and specified herein.

1. Provide accessories, anchorage devices, and other items essential to complete louver installation, though not specifically indicated or specified.

B. Related Work Specified Elsewhere:

1. Division 23, Section “HVAC Mechanical”. Exterior operable louvers, ductwork, and ductwork connections to louvers.
2. Louvers in metal and wood doors are included with the doors, and are not a part of this Section.

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submit product data for each type of louver specified.

C. Submit manufacturer’s installation instructions.

D. Submit manufacturer’s full range color chart for initial color selection.

E. Submit requested metal color chips for final color selection.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Aluminum Louvers.

1. Louvers shall be stationary storm resistant type, extruded aluminum, Model No. 4115 manufactured by Construction Specialties, Inc. Louvers manufactured by Airolite Company or Ruskin are acceptable based on products of equal quality, performance, and appearance as specified herein. Blades and frames shall be minimum 0.081 inch (2.06 mm) thick with reinforcing bosses and shall be of 6063-T5 alloy. Head, jamb, and sill shall be a one piece structural member [as detailed] with integral calking slot and retaining bead. Supports and blades shall have provision for expansion and contraction. Fastenings shall be stainless steel or aluminum. Louvers shall be free of scratches, blemishes, and defects. Sizes shall be as shown on Drawings.
    a. Provide louvers with removable bird screens consisting of extruded aluminum frames and rewirable with 1/2 inch (13 mm) square mesh of 0.063 inch (1.60 mm) diameter aluminum wire. Bird screens shall be attached to interior of louver with stainless steel screws or clips.
    b. Provide louvers with removable insect screens, consisting of aluminum frame with mitered corners and 0.012 inch (0.31 mm) diameter 18 x 14 aluminum wire mesh. Insect screen shall be attached to interior of louver with stainless steel screws or clips.
    c. Louver finish shall be either Kynar 500 or baked enamel finish as selected by the Architect to match adjacent construction.

d. Except at ductwork penetrations into the louver, provide insulated blank-off panels in lieu of insect screens at locations shown on Drawings. Panel shall be fabricated with a 2 inch (50.8 mm) urethane (or Styrofoam) core and faced with 0.032 inch (0.81 mm) embossed aluminum sheets. Perimeter frame shall be extruded aluminum, 0.080 inch (2.03 mm) thick with mitered corners. Panel shall have an R-value of not less than 10 (0.06 watts per square metre per degree C.).
   (1) Provide closed cell PVC compression gaskets at perimeter of panel. Gaskets shall be 1/8 x 1 inch (3.17 x 25.4 mm).
   (2) Secure panel with clips or self-tapping screws.
   (3) Louver blades and frames color shall be Cardinal Red to Match Storefront Frames.

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation.

1. Installation shall be in strict accordance with the manufacturer's instructions.

END OF SECTION 10 82 00

SECTION 11 21 73

LAUNDRY EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers laundry equipment complete. Provide all labor, materials, and equipment necessary to fabricate, furnish and install complete all laundry equipment as shown on the Drawings and specified herein.
   1. Provide all anchors, chairs, fastenings, cut-outs, and bases necessary for the proper installation and anchoring of this equipment.
   2. Provide all electrical wiring and devices, wiring controls, switches, etc., which are an integral part of the equipment. Provide UL approved plugs and cords for items powered by plugging into receptacle. Provide all line switches, safety cut-outs, control panels, fittings, etc., and their connections between equipment and rough-ins at walls and floors.
   3. Provide all plumbing work required to connect equipment to rough-ins.
   4. **Provide all mechanical work required to properly exhaust both the commercial dryer and the industrial drying cabinet at sidewall. This includes but is not limited to all duct work, connectors, hangers, and equipment required for a proper wall penetration. Ensure that wall penetrations are a minimum of 10'-0" from any in-take equipment, or as shown on the mechanical plans, whichever is further.**

B. Related Work Specified Elsewhere:
   1. Refer to all Sections in Division 1, General Requirements.
   2. Division 3, Cast-in-Place Concrete: Foundation bases.
   3. Division 23, Section "HVAC" Mechanical rough-ins.
   4. Division 26, Section "Electrical" Electrical rough-ins.

1.02 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

   1. Preparation Instructions and recommendations

   2. Storage and handling requirements and recommendations.

C. Shop Drawings: Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

D. Coordination Drawings: Indicate locations of laundry equipment and connections to utilities, and clearance requirements for equipment access and maintenance.

E. Operation and Maintenance Data: For laundry equipment to include in emergency, operation, and maintenance manuals. Include a schedule with the following:
   1. Designation indicated on Drawings.
   2. Manufacturer's name and model number.
   3. List of factory-authorized service agencies including their addresses and telephone numbers.

1.03 QUALITY ASSURANCE

A. Make all tests and adjustments necessary and provide maintenance and operating instructions to the Owner when equipment is put into operation.

SECTION 11 21 73

LAUNDRY EQUIPMENT

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store equipment on site protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage.

B. Consult manufacturer if machines are to be stored for an extended period of time.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

A. Washer Extractor Parts Only: Manufacturer's standard form in which manufacturer agrees to repair or replace any part of the equipment assembly that fails within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Washer Extractor Parts Only, Mainframe, Cylinder Shaft Assembly, and Bearings

1. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace main frame, bearing, cylinder or cylinder shaft assembly that fails within specified warranty period.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Washer/Extractors:

Acceptable Manufacturer: UniMac, which is located at: Shepard St. P. O. Box 990; Ripon, WI 54971-0990; Toll Free Tel: 800-587-5458; Fax: 920-748-1664; Email:request info (Opt.Out@alliancels.com); Web:http://www.unimac.com

B. Drying Racks:

Acceptable Manufacturer: Ramair Gear Dryer, phone: 888-393-3379, web: www.ramairgeardryer.com

2.02 MATERIALS – INDUSTRIAL WASHER AND DRYER

A. Industrial Commercial Washer – Unimac Alliance Laundry Systems, 85 lb capacity, nine-speed, 40.1” W x 51.2” D x 67.6” H, ¾” hot and cold water, 208V/60H/3 Ph/3 W, 7-amp full load w/20amp breaker with 12 AWG wire, bolted to floor. Contact: Southeastern Laundry, 770-928-0080.

2.03 MATERIALS – COMMERCIAL WASHER AND DRYER

A. Commercial Washer – Unimac Alliance Laundry Systems, Model #UFNE5BJP115TW01, 3.42 cu. ft., 29” W x 32.75” D x 40” H, 3/4” hot and cold water, 120V/60H/1-15 amp, Operation: Manual Control, Contact: Southeastern Laundry, 770-928-0080.

B. Commercial Dryer – Unimac Alliance Laundry Systems, Model #UDEG5BGS173CW01 (Electric), 7.0 cu. Ft., 26 7/8” W x 28” D x 40” H, 120/240/60/1-15 amp, 4” dryer vent. Contact: Southeastern Laundry, 770-928-0080. **Exhausted to the roof.**

2.04 GEAR DRYING RACK

A. Ramair Gear Dryer, Model #TG-4H, 72.2” x 28” x 77.8”, stainless steel, 12-gauge steel, powder coated paint, motor: 1HP, Speed: 3450 rpm, airflow: 800 cfm, 240V / 60 Hz./ 1, controls: touch screen.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. System Startup and Commissioning: Arrange for a local manufacturer's representative to inspect machines prior to startup and operation.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 ADJUSTMENT AND CLEANING

A. Wipe equipment down after tests and adjustments to bring to clean, sanitary condition at the time the building is turned over to the Owner.

3.06 SCHEDULE

QTY	DRAWING/ KEYNOTE	DESCRIPTION	LOCATION
1	A2.2/#12	RAMAIR DRYER RACK	DECON LAUNDRY 142
1	A2.2/#13	UNIMAC COMMERCIAL FRONTLOAD WASHER	DECON LAUNDRY 142
1	A2.4/#EE	UNIMAC COMMERCIAL FRONTLOAD WASHER	LAUNDRY 121
1	A2.2/#14	UNIMAC COMMERCIAL FRONTLOAD DRYER	DECON LAUNDRY 142
1	A2.4/#FF	UNIMAC COMMERCIAL FRONTLOAD DRYER	LAUNDRY 121
2	A2.2/#15	UNIMAC 85LB EXTRACTOR	DECON LAUNDRY 142

END OF SECTION 11 21 73

SECTION 11 40 00

FOOD SERVICE EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers food service equipment complete.

1. Provide all labor, materials, and equipment necessary to install complete all food service equipment as shown on the Drawings and specified herein.
2. Provide all anchors, chairs, fastenings, cutouts, and bases necessary for the proper installation and anchoring of this equipment.
3. Provide all gas lines and devices, controls, switches, etc., which are an integral part of the equipment. Provide UL approved plugs and cords for items powered by plugging into receptacle. Provide all line switches, safety cutouts, control panels, fittings, etc., and their connections between equipment and rough-ins at walls and floors.

B. Related Work Specified Elsewhere:

1. Refer to all Sections in Division 1, General Requirements.
2. Division 23 Section “HVAC Mechanical”
3. Division 26 Section “Electrical”
4. Division 22 Section “Plumbing”

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submit product data for each type of equipment specified and all accessories.

C. Submit manufacturer’s installation instructions, operation manual and maintenance data.

D. Submit manufacturer’s standard warranty.

E. Include warranties and operation and maintenance material in the project close-out documents.

1.03 JOB CONDITIONS

A. Protection:

1. Protect all Work until Substantial Completion of the Project. Keep all items covered and otherwise protected from damage by other trades. Replace or repair all damaged items.

PART 2 – PRODUCTS

2.01 MATERIALS – ALL FOOD SERVICE EQUIPMENT WILL BE PROVIDED BY THE GENERAL CONTRACTOR IN ACCORDANCE WITH THE ATTACHED SCHEDULE AND PRODUCT INFORMATION SHEETS. THE CONTRACTOR SHALL COORDINATE DELIVERY OF ALL EQUIPMENT AND SHALL INSTALL ALL EQUIPMENTAND MAKE ALL EQUIPMENT CONNECTIONS AS PART OF THE CONTRACT FOR CONSTRUCTION.

2.02 THE CONTRACTOR SHALL REVIEW THE SCHEDULE OF EQUIPMENT, PRODUCT DATA SHEETS, AND MANUFACTURER’S INSTALLATION REQUIREMENTS AND SHALL PROVIDE MATERIALS AND LABOR FOR REQUIRED BLOCKING, EQUIPMENT

PADS, ANCHORAGE COMPONENTS, AND ALL OTHER REQUIRED ACCESSORIES FOR COMPLETE INSTALLATION OF ALL EQUIPMENT.

2.03 Products shall be as indicated in schedule below. Any substitutions shall be submitted to Architect for review prior submittal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Field Measurements:

1. Verify all pertinent dimensions of the building and conditions at job site before start of fabrication. Check all walls and corners for squareness and clearances. Evaluate access to the various areas and provide the equipment in increments which will pass freely through provided openings.

3.02 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. Set in place and install all equipment according to the manufacturer's instructions.
2. Do all Work at times when construction and all other trades have advanced to the point that will permit equipment installation.

3.03 ADJUSTMENT AND CLEANING

A. Make all adjustments necessary prior to turning building over to Owner.

B. Wipe equipment down after tests and adjustments to bring to clean sanitary condition at the time the building is turned over to the Owner.

REFER TO SCHEDULE ON FOLLOWING PAGE

3.04 SCHEDULES

Equipment Type	Manufacturer	Model No.	Width	Depth	Height	Comments
Gas Range - Kitchen	**Castle**	**F3226-36**	**60”**	**30 ½”**	**36 ½”**	**Stainless Steel, Casters**
Residential Dishwasher	**GE**	**GDT225 SSL-SS**	**23.5”**	**23.75”**	**32.25”**	**NSF Certified**
Coffee Maker – Kitchen	**Bunn**	**AXIOM-DV-3 2 upper warmers and 1 lower warmer WITH WATER LINE**	**8”**	**17.7”**	**18.9”**	**Stainless finish** **In-line water filter** **Provide 1 Black Plastic Funnel #20583.0003** **Provide 1 Decaf Coffee Pot #42401.0101** **Provide 2 Reg. Coffee Pots #42400.0101**
Microwave – Kitchen Qty. (2)	**LG**	**LCRT1513**	**21 7/8”**	**17 7/32”**	**12 ½”**	**Stainless Steel, 1.5 cu.ft. 1100 Watt**
Reach-in Solid Swing Door Dual Temperature Refrigerator/ Freezer – Kitchen **Qty. (3)**	**Everest**	**Ebsrf2**	**49.625**	**33.125”**	**82”**	**Stainless Steel, Options: 6” Standard Legs, Alternate Door Hinging, Lockable with 3 unique keys, Additional Shelves (2)**
Ice Maker – Vest 105A	**Ice-O-Matic**	**ICE0250A**	**30.13”**	**24.25”**	**20”**	**Produces up to 361 lbs of ice per day**
Beverage Cooler	**Edge Star**	**CBR902 – SG DUAL**	**30”**	**23.5”**	**32”**	**160-can, glass doors. Shelves sstainless exterior, temp range: 38 – 65F**
Ice Storage Bin – Vest 105A	**Ice-O-Matic**	**B40PS**				**Stores 344 lbs. of ice, Provide (1) 82 oz ice scooper**

END OF SECTION 11 40 00

SECTION 11 41 00

MISCELLANEOUS EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers miscellaneous equipment complete.

1. Provide all labor, materials, and equipment necessary to install complete all equipment as shown on the Drawings and specified herein.
2. Provide all anchors, chairs, fastenings, cutouts, and bases necessary for the proper installation and anchoring of this equipment.
3. Provide UL approved plugs and cords for items powered by plugging into receptacle. Provide all line switches, safety cutouts, control panels, fittings, etc., and their connections between equipment and rough-ins at walls and floors.

B. Related Work Specified Elsewhere:

1. Refer to all Sections in Division 1, General Requirements.
2. Division 23, Section “HVAC Mechanical”.
3. Division 26, Section “Electrical”.
4. Division 22, Section Plumbing

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submit product data for each type of equipment specified and accessories.

C. Submit manufacturer’s installation instructions, operation manual and maintenance data.

D. Submit manufacturer’s standard warranty.

E. Include warranty and operations and maintenance manuals in project close-out documents.

1.03 JOB CONDITIONS

A. Protection:

1. Protect all Work until Substantial Completion of the Project. Keep all items covered and otherwise protected from damage by other trades. Replace or repair all damaged items.

PART 2 – PRODUCTS

2.01 MATERIALS – ALL EQUIPMENT WILL BE PROVIDED BY THE GENERAL CONTRACTOR IN ACCORDANCE WITH THE ATTACHED SCHEDULE AND PRODUCT INFORMATION SHEETS. THE CONTRACTOR SHALL COORDINATE DELIVERY OF ALL EQUIPMENT AND SHALL INSTALL ALL EQUIPMENTAND MAKE ALL EQUIPMENT CONNECTIONS AS PART OF THE CONTRACT FOR CONSTRUCTION.

2.02 THE CONTRACTOR SHALL REVIEW THE SCHEDULE OF EQUIPMENT, PRODUCT DATA SHEETS, AND MANUFACTURER’S INSTALLATION REQUIREMENTS AND

SHALL PROVIDE MATERIALS AND LABOR FOR REQUIRED BLOCKING, EQUIPMENT PADS, ANCHORAGE COMPONENTS, AND ALL OTHER REQUIRED ACCESSORIES FOR COMPLETE INSTALLATION OF ALL EQUIPMENT.

2.03 Products shall be as indicated in schedule below. Any substitutions shall be submitted to Architect for review prior to Bid.

PART 3 – EXECUTION

3.01 PREPARATION

A. Field Measurements:

1. Verify all pertinent dimensions of the building and conditions at job site before start of fabrication. Check all walls and corners for squareness and clearances. Evaluate access to the various areas and provide the equipment in increments which will pass freely through provided openings.

3.02 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. Set in place and install all equipment according to the manufacturer's instructions.
2. Do all Work at times when construction and all other trades have advanced to the point that will permit equipment installation.

3.03 ADJUSTMENT AND CLEANING

A. Make all adjustments necessary prior to turning building over to Owner.

B. Wipe equipment down after tests and adjustments to bring to clean sanitary condition at the time the building is turned over to the Owner.

REFER TO SCHEDULE ON FOLLOWING PAGE

3.04 SCHEDULES

Reference Plan Keynote: 9

Item: Hazmat Flammable Liquid Storage Cabinet

Manufacturer:	Global Industries, Inc. / Wilray Safety Storage Cabinets
Model Number:	Cabinet: WQ248171YL / Spill Kit: WQ921174
Item/Description:	Flammable liquid 30 Gallon (PCS-330) storage cabinet with 18-gauge double wall steel construction, self-closing/self-latching doors, leak-proof sill and sump, galvanized shelves, vent inlet/outlet, 4" raised legs and intumescent fire seals. Provide 5-gallon universal spill response kit with cabinet unit.
Dimensions:	30 Gallon - 42"w x 20"d x 44"h
Finish:	Standard bright yellow.

Reference Plan Keynote: CC

Item: Commercial Mop Bucket with Ringer and Mops

Manufacturer:	Rubbermaid
Model Number:	Mop Bucket FG757688YEL / Mop Handle FGH225000000 / Mop Head FGF21700WH00
Item/Description:	44 Qt. Polypropylene Mop Bucket and Wringer with aluminum mop handle and cut end mop head. Provide two mop handles and two mop heads per mop bucket/wringer.
Dimensions:	17"w x 24"d x 38"h - 44 QT. Bucket and 60" mop handle
Finish:	Standard yellow.

Reference Plan Keynote: 5

Item: Wall Mounted Gear Grid Lockers

Manufacturer:	Gear Grid, LLC
Model Number:	GEARGRID Wall Mounted Storage System
Item/Description:	Gear Grid wall mounted lockers with secure grid doors, adjustable wire shelving, heavy duty 1¼" steel tubing, ¼" cold-rolled wire side, back and shelves, 1 top shelf, 1 bottom shelf, 3 apparel hooks and nameplate slot.
Dimensions:	20"w x 20"d x 79"h
Finish:	Standard red powder coated.

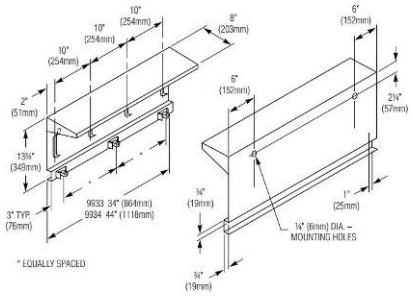
Specification Item Number: 5

Item: Stand-Alone Gear Grid Lockers

Manufacturer:	Gear Grid, LLC
Model Number:	GEARGRID Stand-Alone 6-Pack
Item/Description:	20" Gear Grid stand-alone lockers with secure grid doors, adjustable wire shelving, heavy duty 1¼" steel tubing, ¼" cold-rolled wire side, back and shelves, 1 top shelf, 1 bottom shelf, 3 apparel hooks and nameplate slot. Base frame shall be epoxy bolted to floor.
Dimensions:	75"w x 47"d x 83"h
Finish:	Standard red powder coated.

Reference Plan Keynote: CC

Item: Utility Shelf with Hooks and Holders



Manufacturer:	Bradley Corporation
Model Number:	9934
Item/Description:	Wall mounted 18 gauge stainless steel utility shelf with 5 stainless steel hooks and 4 spring-activated rubber cam holders.
Dimensions:	44”w x 8”d x 13.75”h
Finish:	Standard satin finish stainless steel.

Reference Plan Keynote: 6

Item: Air Tank Filler Station

Manufacturer:	Mako Compressors
Model Number:	BAM04-7H
Item/Description:	Breathing air module [BAM] 6000 psi, 1800 rpm compressor fill tank.
Dimensions:	45 1/2”w x 86”d x 70”h
Finish:	Standard finish.

Reference Plan Keynote: 8

Item: Air Compressor

Manufacturer:	Kobalt
Model Number:	XC802000
Item/Description:	Electric air compressor, 5 HP, 4 cylinders.
Dimensions:	28”w x 26”d x 70”h
Finish:	Standard finish.

Reference Plan Keynote: 7

Item: 5-Shelf Mini Mobile Hose System

Manufacturer:	Gear Grid, LLC
Model Number:	GEARGRID 5-Shelf Mini Mobile Hose Storage
Item/Description:	Gear Grid mobile hose with 4 locking casters designed to accommodate 1000’ of 2.5” hose.
Dimensions:	80”w x 20”d x 59”h
Finish:	Standard red powder coated.

Reference Plan Keynote: 20

Item: Four Burner Gas Grill with Timer Shut-off

Manufacturer:	Weber
Model Number:	E-470
Item/Description:	Four burner natural gas grill with stainless steel grate, rotisserie, smoke box, handle light, side burner and and side shelf, 48,000 BTU. Provide automatic gas timer shut-off valve.
Dimensions:	26.5”d x 66”w x 50.5”h
Finish:	Stainless Steel.

END OF SECTION 11 41 00

SECTION 12 24 13

SOLAR SHADES

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section includes the following:

1. Solar Shades – Manual Control
2. Solar Shades – Automatic Control

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product data: Manufacturer's complete CSI 3- part specification sheet.

C. Samples:

1. Submit working hand sample or mock up shade as required.
2. Submit two (2) 6" samples of shade fabric.

1.03 DELIVERY, STORAGE AND HANDLING

A. Product to be delivered in manufacturer's original packaging.

B. Products to be handled and stored to prevent damage to materials, finishes and operating mechanisms. Store in a clean, dry area, laid flat to prevent sagging and twisting of packaging.

1.04 WARRANTY

A. Provide Manufacturer's Limited Lifetime Warranty against material and manufacturing defects and a one year warranty on installation

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Legrand www.legrand.us/shading-systems

B. Substitutions Request: Submit for approval under provisions of Specification Section 01 63 00 Product Substitutions.

2.02 MANUAL SHADING SYSTEM

A. Product: TS Series Manual Shades

B. Solar Shade Fabric: Select from NFPA 701-1999 FR and ASTM-G21 and G22 Bacteria and Fungal Resistance approved:

1. Translucent Shades:
   a. Fabric Style: Sheerweave Style 9000
   b. Color Name: S04 Silver
   c. Openness: 3%
   d. Location: All exterior windows (except at Conference Room)

C. Roller Tubes: Shall be an extruded aluminum tube with a wall thickness of .050", incorporating two (2) internal locking channels running the length of the tube for added strength and durability. Shade material will be attached to the tube by placing fabric end into internal locking channel and inserting a vinyl strip the length of the tube, locking fabric into place.

D. Clutch Systems: Shall be a wrap spring design with high strength acetal and glass filled nylon components. Spring shall be stainless steel and will raise and lower the shade by means of a continuous #10 stainless steel bead chain.

E. Clutch Operation will be by means of a continuous #10 Stainless Steel bean chain providing counterbalanced spring assemblies.

F. Idle End is made of nylon with a spring loaded center pin for smooth and quiet operation.

G. Roll Orientation: Standard will be fabric coming from backside of tube closest to the window.

H. Bottom Hem Bar will be extruded aluminum measuring 1.2" high by .58" deep with a .050" wall thickness. The room facing side of the hem bar will be fabric wrapped with the fabric secured by a vinyl locking strip insert at the top and bottom of the bar. The backside of the bar will be either white, anodized silver or bronze with color coordinated injection molded thermoplastic end plugs.

I. Installation brackets without fascia shall be .060"thick and available in white or black and shall facilitate side, rear and top mounting applications. For shades with fascia option, brackets shall measure .065" thick and color coordinated to match fascia.

J. Options to be provided:

1. Fascia will be extruded aluminum measuring .075" thick, snap in locking system and will enclose the roller tube and mounting brackets.
   a. Color: Architect to select from manufacturer's standard.

2. Side Channels will be extruded aluminum measuring 1.25" by 2.06" with a wall thickness of .060". Side channels will include a mole hair weather stripping insert.
   a. Color: Architect to select from manufacturer's standard.

3. Sill Channels will be extruded aluminum measuring 1.25" by 2.06" with a wall thickness of .060". Sill channels will include a mole hair weather stripping insert.
   a. Color: Architect to select from manufacturer's standard.

2.03 MOTORIZED SHADING SYSTEM

A. Product: TS Series Motorized Shades

B. Solar Shade Fabric: Select from NFPA 701-1999 FR and ASTM-G21 and G22 Bacteria and Fungal Resistance approved:

1. Translucent Shades:
   a. Fabric Style: Sheerweave Style 9000

b. Color Name: S04 Silver
c. Openness: 3%
d. Location: All exterior windows (except at Conference Room)

C. Roller Tubes: Shall be an extruded aluminum tube with a wall thickness of .050", incorporating two (2) internal locking channels running the length of the tube for added strength and durability. Shade material will be attached to the tube by placing fabric end into internal locking channel and inserting a vinyl strip the length of the tube, locking fabric into place.

D. Motorized Systems: Shall be a counter-balance spring design that allows shades to be manually pulled into position using the hembar.

E. Motor: Low-voltage DLM motor is self-configuring digital devices incorporating both a wired connection and wireless Bluetooth low energy technology built-in for a variety of control options.

F. Idle End is made of nylon with a spring loaded center pin for smooth and quiet operation.

G. Roll Orientation: Standard will be fabric coming from backside of tube closest to the window.

H. Bottom Hem Bar will be extruded aluminum measuring 1.2" high by .58" deep with a .050" wall thickness. The room facing side of the hem bar will be fabric wrapped with the fabric secured by a vinyl locking strip insert at the top and bottom of the bar. The backside of the bar will be either white, anodized silver or bronze with color coordinated injection molded thermoplastic end plugs.

I. Installation brackets without fascia shall be .060"thick and available in white or black and shall facilitate side, rear and top mounting applications. For shades with fascia option, brackets shall measure .065" thick and color coordinated to match fascia.

J. Options to be provided:

1. Fascia will be extruded aluminum measuring .075" thick, snap in locking system and will enclose the roller tube and mounting brackets.
   a. Color: Architect to select from manufacturer's standard.

2. Side Channels will be extruded aluminum measuring 1.25" by 2.06" with a wall thickness of .060". Side channels will include a mole hair weather stripping insert.
   a. Color: Architect to select from manufacturer's standard.

3. Sill Channels will be extruded aluminum measuring 1.25" by 2.06" with a wall thickness of .060". Sill channels will include a mole hair weather stripping insert.
   a. Color: Architect to select from manufacturer's standard.

2.04 FABRICATION

A. Shades shall be fabricated according to specifications and accurate to tolerance established by SWF engineering standards.

PART 3 – EXECUTION

3.01 INSPECTION

A. Contractor's installer shall be responsible for inspection of jobsite, approval of mounting surfaces, verification of field measurements and installation conditions. Installation shall commence when satisfactory conditions are met.

3.02 INSTALLATION

A. Install shades in accordance with manufacturer's instructions including recommended support brackets and fasteners by Manufacturer's authorized dealer or internal installation team.

B. Install shades with adequate clearance to permit smooth operation of the blinds. Demonstrate blinds to be in smooth, uniform working order.

C. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
   a. Fascias
   b. Closure panels
   c. Endcaps

D. Electrical Connections: Connect each roller shade motor operator and stationary control system to building electrical system.
   a. Grounding: Provide electrical grounding in accordance with NFPA 70
   b. Connect networked automation controls for motorized equipment to building management system.

3.03 TESTING

A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
   a. Chain operation
   b. Motorized operating mechanism

B. During daylight hours, lower shades and turn off lights. Verify that there are no light leaks at perimeter or within shade assembly. Correct deficiencies.

C. Test motorized window shades to verify that controls, limit switches, interface to other building systems, and other operating components are functional. Correct deficiencies.

D. Demonstrate operation of shades to Owner's designated representatives.

3.04 MAINTENANCE AND CLEANING

A. Maintain and clean shades in accordance with manufacturer's instructions.

END OF SECTION 12 24 13

SECTION 12 36 61

SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface vanities.
3. Solid surface material backsplashes.
4. Solid surface material end splashes.
5. Solid surface material apron fronts.
6. Solid surface window sills.
7. Solid surface adhesives and sealants.

B. Related Requirements:

1. Section 06 10 00 “Rough Carpentry”
2. Section 06 40 23 “Interior Arch Woodwork”

1.3 SUBMITTALS

A. Product Data: For countertop and sill materials including manufacturer's technical data sheets, and published written instructions.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For countertops. Submit dimensioned shop drawings showing countertop layouts, materials, finishes, edge and backsplash profiles, methods of joining, terminations, and cutouts.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.
3. Show plumbing installation provisions.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and fabricator.

B. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties

C. Warranty: Submit specimen copy of specified warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 quality management system certification for manufacturing facility(ies).

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

1. Manufacturer-certified fabricator.

C. Installer Qualifications: Manufacturer certified fabricator of countertops.

D. Mock-ups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Show recorded measurements on shop drawings.

1.8 COORDINATION

A. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays

B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and installer agree to repair or replace sheet material not free from defects in materials, fabrication, or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP AND WALL MATERIALS

A. Composition Solid-Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart LLC; or a comparable product by one of the following:
   a. DuPont USA, Corian
   b. LG Hausys America, Inc.

2. Thickness: **0.490 inch**
3. Panel Weight: **4.4 lb/sq. ft.**
4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   a. Flame-Spread Index: **25** or less.
   b. Smoke-Developed Index: **50** or less.
5. Colors and Patterns: As indicated on Drawings.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: **Premium**.

B. Configuration:

1. Front: 1-1/2-inch with top bevel edge.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops: 1/2-inch thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch thick, solid surface material.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings and similar items.

2.3 INSTALLATION MATERIALS

A. Joint Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall have a VOC content of **70** g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Color: Complementary to quartz surface color.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

C. Construction Adhesive: Countertop manufacturer's recommended silicone-based construction adhesive for backsplashes, endsplashes, and other applications according to manufacturer's published fabrication instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 COUNTERTOP INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by adhering with 100-percent silicone material in dab format (not bead format) to base units into underside of countertop at 18 to 24 inches o.c. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten countertops by adhering with 100-percent silicone material in dab format (not bead format) to base units into underside of countertop at 18 to 24 inches o.c. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops or wood-web frame with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

3.3 REPAIRS

A. Remove and replace quartz surfacing components that are damaged and cannot be satisfactorily repaired.

3.4 CLEANING PROTECTION

A. Clean solid surfacing components according to manufacturer's published maintenance instructions.

B. Completely remove excess adhesives and sealants from finished surfaces.

C. Protect completed work from damage during remainder of construction period

END OF SECTION 12 36 61

SECTION 12 36 62

QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate surfacing countertops.
2. Adhesives and sealants.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry"
2. Section 06 41 16 "Interior Arch Woodwork"

1.3 REFERENCES

A. ASTM C 97: Standard Test Methods for Absorption ad Bulk Specific Gravity of Dimension Stone.

B. ASTM C 170: Standard Test Method for Compressive Strength of Dimension Stone.

C. ASTM C 501: Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by Taber Abraser.

D. ASTM C 834: Standard Specification for Latex Sealants.

E. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.

F. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

G. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ISO: International Organization of Standardization.

I. ISO 9001: Quality Management Systems.

J. NSF/ANSI Standard 51: Food Equipment Materials.

K. SCAQMD Rule 1168: Adhesive and Sealant Applications.

L. UL 2818: GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes, and Furnishings.

1.4 SUBMITTALS

A. Product Data: For countertop materials.

1. Submit data for each specified product. Include manufacturer's technical data sheets and published installation instructions.
2. Submit Safety Data Sheets (SDS) for adhesives and sealants.

B. Shop Drawings: For countertops. Submit dimensioned shop drawings showing countertop layouts, joinery, edge conditions, terminations, substrate construction, cutouts, and holes.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.
3. Show plumbing installation provisions.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. One full-size quartz agglomerate countertop, with front edge, 8 by 10 inches, of construction and in configuration specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.

C. Warranty: Submit specimen copy of specified warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Submit manufacturer's published maintenance and care manual. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements

1. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.
2. Adhesives, Sealants, and Sealant Primers.

    a. SCAQMD (South Coast Air Quality Management District) Rule 1168.

B. Manufacturing Facility Qualifications: Quartz surfacing materials produced in an ISO 9001 certified facility.

C. Fabricator Qualifications: Minimum of five years documented experience in fabricating quartz surfacing countertops similar in scope and complexity to this Project, using water-cooled cutting tools. Currently certified by the manufacturer as an acceptable fabricator.

D. Installer Qualifications: Minimum of five years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for shipping and handling quartz surfacing materials to preclude breakage and damage. Brace quartz surfacing units as necessary during shipment, transporting in near-vertical position with finished face towards finished face. Do not allow finished surfaces to rub during shipping and handling.

B. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by the manufacturer. Store quartz surfacing sheet materials on racks in near-vertical position to preclude damage. Store with finished face turned towards finished face. Prevent warpage and breakage.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops and openings by field measurements after base cabinets are installed but before countertop fabrication is complete. Show recorded measurements on shop drawings.

B. Adhesives: Acclimate adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.10 COORDINATION

A. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.11 WARRANTY

A. Manufacturer's Limited Warranty: Standard 10 Year Commercial and Residential Limited Warranty against defects in quartz surfacing sheet materials.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of up to 93 percent quartz aggregate combined with polyester resin binders and proprietary pigments that are fabricated using vacuum vibrocompaction technology.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart; Wilsonart Quartz or a comparable product by one of the following:

   a. Ceasarstone USA.
   b. LG Hausys America, Inc.

2. Composition: Up to 93 percent quartz aggregate combined with polyester resin binders and proprietary pigments that are fabricated into slabs using Bretonstone vacuum vibrocompaction technology.
3. Material Thickness: **Product Type 062, 0.79 inch**, nominal.
4. Material Weight: **10 lb/sq.ft. for 0.79 inch thick surfacing**.
5. Countertop Dimensions: **As indicated on Drawings**.
6. Conformance Standards:

   a. NSF/ANSI Standard 51.
   b. UL 2818:

      1) GREENGUARD, emission levels in UL 2818, Section 7.1 are applicable for furniture products.
      2) GREENGUARD Gold, emission levels in UL 2818, Section 7.2 are applicable for building materials, finishes, and furnishings.

7. Physical Characteristics:

   a. Flexural Strength: Greater than 4,500 psi; ASTM D 790.
   b. Flexural Strain: Less than 0.375 percent; ASTM D 790.
   c. Flexural Modulus: Greater than 3.75 MPsi; ASTM D 790.
   d. Stain resistance (24 Hour): No effect to moderate effect; NEMA LD-3.
   e. Abrasion Resistance: Greater than 100 in. lbs.; ASTM C 501.
   f. Density: Greater than 2.1 g/.cu. m per ASTM C 97.
   g. Compressive Strength (One Axis - Div.): Greater than 20,000 psi per ASTM C 170.
   h. Moisture Absorption: Less than 0.03 percent per ASTM C 97.
   i. Surface Burning Characteristics: Class I and Class A per ASTM E 84.

8. Quartz Finish: Polished finish with Glossometer reading greater than 45.
9. Colors and Patterns: **As indicated on Drawings**.
10. Edge Detail: Waterfall Edge, 45 degree Miter

2.2 COUNTERTOP FABRICATION

A. General: Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart Quartz Fabrication manual.

B. Joint Seams: Form joint seams between quartz surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

C. Cutouts and Holes: Provide holes and cutouts for service fixtures and similar countertop-mounted items as indicated. Form cutouts to required template or pattern, with smooth, even curves and eased edges.

D. Countertops: **0.79-inch** thick, quartz agglomerate with 45-degree miter edge.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical. Retain "Fittings" Subparagraph below if using deck-mounted fittings or soap dispensers.
3. Fittings: Drill countertops in shop for plumbing fittings and similar items

2.3 INSTALLATION MATERIALS

A. Joint Adhesive: Methacrylate-based adhesive for chemically bonding quartz surfacing seams. Color complementary to quartz surfacing sheet material. UL 2818 GREENGUARD Gold certified and complying with SCAQMD Rule 1168.

1. Basis-of-Design Product: Wilsonart Hard Surface Adhesive.
2. Adhesives shall have a VOC content of **70** g/L or less.

B. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C920, Type S (single component), Grade NS (nonsag).

1. Basis-of-Design Product: Wilsonart; Color Matched Caulk.
2. Color: Complementary to quartz surfacing color.

C. Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 384, Type OP, Grade NF, and SCAQMD Rule 1168.

1. Basis-of-Design Product: Wilsonart; Color Matched Caulk.
2. Color: Complementary to quartz surfacing color.

D. Construction Adhesive: Countertop manufacturer's recommended silicone-based construction adhesive for backsplashes, endsplashes, and other applications according to manufacturer's published fabrication instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops. Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 COUNTERTOP INSTALLATION

A. Install quartz surfacing components plumb, level, and true according to approved shop drawings and manufacturer's published installation instructions. Use woodworking and specialized fabrication tools acceptable to the manufacturer.

1. Fasten quartz surfacing components to base cabinets or other supporting substrates with suitable adhesives acceptable to manufacturer.

B. Form joint seams with specified seam adhesive. Seams to be inconspicuous in completed work. Seams in locations shown on approved shop drawings and acceptable to manufacturer. Promptly remove excess adhesive.

1. Clamp or brace quartz surfaces in position until adhesive sets.

C. Fill gaps between countertop and terminating substrates with specified silicone sealant.

D. Install backsplashes and endsplashes where indicated on Drawings. Adhere to countertops with specified construction adhesive.

3.3 REPAIRS

A. If permissible to Architect, minor surface marring for quartz surfacing components may be repaired according to manufacturer's published installation instructions.

B. Remove and replace quartz surfacing components that are damaged and cannot be satisfactorily repaired.

3.4 CLEANING AND PROTECTION

A. Clean quartz surfacing components according to manufacturer's published maintenance instructions.

B. Completely remove excess adhesives and sealants from finished surfaces.

C. Protect completed work from damage during remainder of construction period.

END OF SECTION 12 36 62

SECTION 12 40 00

FIXTURES, FURNISHINGS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes loose furnishings and equipment to be supplied and installed under the construction package.

1.02 GENERAL REQUIRMENTS

A. The Contractor is responsible for performing the work listed in the Summary for this Contract. The Contractor is advised to take all of the provisions herein into consideration when preparing his bid and all costs associated with performing work resulting from **all sections**. The Contract Documents shall be construed so as to require the Contractor to perform all work reasonably inferable there from as being necessary in order to produce the indicated operational or finished result.

B. The Supplier shall assign one (1) project manager to oversee the entire contract through to the satisfactory installation of the specified furniture. This person will be the coordinator for the Supplier and the Designated Owner's Representative's liaison with the Supplier. It is the responsibility of this project manager to conform to the items and instructions outlined in these Documents.

1. Supplier/Project Manager shall be capable of providing full planning, procurement and installation services for all specified furniture included within this section.
2. Supplier/Project Manager shall have a local showroom/warehouse within 50 miles of the Project site.

1.03 SCOPE OF WORK

A. This package includes the supplying, warehousing as needed and installation of the loose and fixed furniture, files and accessories as indicated in the individual specification sheets.

B. The Project Manager shall be responsible to coordinate the requirements of installation with the Contractor and Designated Owner's Representative through attendance at coordination meetings as required.

C. Prior to ordering, Supplier must submit finishes for approval and sign-off.

D. Responsibilities include ordering, expediting, receiving, checking for freight damage, filing freight claims, storing, delivery, assembly, and installation of all items to the job site, locating each item as shown on plan or as directed by the Designer. The items shall all be installed in perfect condition. No damaged items will be acceptable.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

C. Shop Drawings and Submittals: Show the following:

1. Shop Drawings of any specials, not part of a running line.
2. Submit fabric and finish samples for approval.
3. The Contractor shall prepare a binder with product information (cleaning and maintenance recommendations, electrical requirements and limitations, operational directions, etc.), warranties and contacts for the Owner's record and use in the future. This shall be submitted to the Owner prior to final payment.
4. The Project Manager shall submit a copy of the order acknowledgments to the Architect for a cursory review. This is done to try to catch any order input errors to minimize problems at the end of the job.

1.05 WORKMANSHIP AND QUALITY

A. All products are to be new, current model, and of the best quality as measured by accepted standards of the trade. Defects in any product may cause it to be rejected.

1. The use of a brand or trade name is not intended to limit or restrict competition; it is to establish a level of quality and choice of "style" or "period" design. "Equal" products will be considered unless otherwise specified. Equal products are to be extremely similar in design and detailing, produced of the same materials, produced with the same or better construction methods as the products specified. Refer to "General Conditions" for instructions for proposing "equal" products. It is extremely important that these instructions be followed. Submittals of inferior quality and different "style" or "period" will not be considered. Frivolous submittals for approved "equals" will not be answered.

B. The methods of fabrication, gluing, assembly, upholstering, and finishing shall be in accordance with the best commercial and construction practices of manufacturers specializing in the manufacture of commercial/institutional furnishings.

C. The furniture and equipment shall be of a quality capable of withstanding the normal rugged usage of institutional routine and of the type which can be maintained continually in service with a minimum of maintenance cost.

D. The furniture and equipment supplied shall be free from defects affecting appearance or serviceability. Joint work shall be strong mortise and tenon, tongue and groove, double dowel or as indicated for the various items in the more detailed specifications following.

1.06 DELIVERY, STORAGE AND HANDLING

A. All materials shall be new and of the kind and quality indicated in the more detailed specifications following.

B. There shall be no direct deliveries without the Contractor's installer present and prior notification and coordination of delivery time with Owner's representative. All deliveries must be set in place, punched and signed-off by an Owner's Representative prior to acceptance of items by Owner. If the intended space is not ready at the scheduled time of installation, alternative solutions will be made.

C. The Owner shall, prior to acceptance of the Project as being satisfactory, run a complete punch list on all items herein and final payment will be made only after these items are corrected or replaced.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PROJECT

A. Basis of Design Manufacturer
1. Refer to attached FURNITURE SCHEDULE.
2. Or Architect/Owner approved equal prior to Bid.

B. Provide matching/coordinating wood and wood plastic laminate finish throughout, utilizing manufacturer's standard finish whenever possible and custom when needed to match.

C. Confirm coordination of furniture to be provided with plan for electrical, wire management and blockage of windows. Field verify areas with critical dimensions.

D. Key all units in bunk areas individually based on (3) occupants per bunk.

E. All filing to be letter sized.

F. Vendor shall confirm that all components in the workstation fit and work together properly.

2.02 MATERIALS

A. All materials shall be new and of the kind and quality indicated in the more detailed specifications following.

B. Lumber for all exposed work shall be as specified in the detailed specifications and shall be sound, free from defects. All lumber used shall be well air dried and then kiln dried to a moisture content of 6% or less by weight.

C. Plywood for all exposed surfaces shall be a minimum of three plies or the number of plies specified. If not indicated, the exposed veneer shall be selected for grain, figure, and color and shall not be less than 1/36" thick nor more than 1/16" thick. Unless otherwise specified, where the term 5 ply built-up stock is used in the detailed specifications, panels have a solid core stock of Basswood or Northern Poplar, of glued up strips not more than 4" wide, with two layers of veneer (one layer of which is cross-banded) glued to both the top and bottom surfaces of the solid wood core. The thickness of the core shall not be less than ¾", unless otherwise specified.

D. Metals shall be of the kind and quality called for in the more detailed specifications. Where gauges and grades are not indicated, they must be equivalent to those used in the manufacture of the best quality products of like nature and of equal to or greater quality than that used for the manufacture of the specific item of Manufacturer indicated in the product specifications.

E. Glue for plywood application shall be of the best quality resinous waterproof glue. For joining solid woodwork all glue shall be animal hide glue, Peter Cooper No. 1 Grade or equal. All glue shall be applied under the most advantageous conditions with respect to pressure, temperature, and length of time under pressure in accordance with the recommendations of the U.S. Forest Products Laboratory.

F. Unless otherwise specified, glides that are rubber cushioned with hardened steel bearing surfaces shall be attached to the bottoms of all tables and seating units so that the bottoms of legs, sled bases, etc. do not come in direct contact with surfaces on which they are to rest.

G. Finish for exposed wood surfaces, unless otherwise specified, shall consist of the required applications of a good quality water and dent resistant lacquer or varnish to furnish a depth of

body acceptable to the Owner. The finish process shall include the proper sanding between applications. All edges shall be sanded smooth and the bottoms of all surfaces that may come in contact with hands, legs or clothing shall be finished the same as exposed surfaces.

H. Finish for metal surfaces shall be of the color and kind called for in the detailed specifications. All metal parts and surfaces which come into contact with stored material, hands, body or clothes shall be free from wrinkles, burrs or sharp edges. When not otherwise specified, the finish shall be a smooth, durable baked-on high grade enamel.

2.03 SEATING

A. STYLES

1. Refer to individual product specifications for detailed reference and pictures of seating styles. Note: the pictures are for reference only and do not purport to show all of the requirements, refer to INDIVIDUAL ITEM SPECIFICATIONS AND DESCRIPTIONS for listing of all requirements. Styles of the seating are as important as the construction elements. For all substitutions, the Bidder must submit as part of their request all technical and style comparison information for review.

B. CONSTRUCTION

1. All seating shall be fully assembled and shipped ready for installation.
2. Acceptable wood species for any exposed wood framed seating to be stained includes poplar, maple and cherry as indicated in individual specifications. A mahogany stain is used in the facility. Stains on any alternate must match the designer's sample.
3. All exposed upholstery seams shall be backed and double stitched.
4. Wood framed seating shall have joints doweled and glued and/or screwed as required for institutional seating items.
5. No wood framing members shall be less than 1 1/16" thick in dimension.
6. All cushioned seat and back foam shall be a high resilient polyurethane with the following ILD ratings @ 25% deflection.
   Task Seating - 35 pounds +/ - 5 pounds
   Guest Seating is not applicable.
7. All seating shall be supplied with either glides or casters as required. Casters to be universal or as specified.
8. No exposed fastenings are permitted, U.N.O.
9. All fabric shall be adhered in a manner to prevent fabric from pulling away from foam.
10. Yardage Requirements shall allow for symmetrical application of material patterns and repeat(s) of same.
11. Task seating shall have as a minimum a five-star base, swivel-tilt control, adjustable back height, and posture seating, pneumatic controls and adjustable arms, u.n.o. Note any additional requirements in individual specifications.
12. Any exposed spot welding on metal frames shall be of finish grade. Indentations, raised welds or flash are not acceptable.

C. DIMENSIONS

1. Refer to Individual Product Specifications for dimensions.
2. Dimensions listed for fixed seating are critical, unless noted otherwise. Arm heights shall be coordinated with corresponding desk/table clearances.

D. RATINGS

1. All seating units shall meet or exceed all ANSI/BIFMA safety & performance standards. Verification of testing certificate shall be furnished upon request.
2. Foam used in seating shall meet or exceed all applicable local Flammability codes and shall not contain chlorofluorcarbons (CFS's).
3. All fabrics shall meet California Technical Bulletin 117 for fire retardancy, UF AC-Class 1 ASTM -E 84 Class A.
4. All fabrics shall exceed the NAFM requirements for heavy-duty use of 15,000 double rubs on the Wyzenbeck test method.
5. All fabrics shall meet or exceed the AATCC 16A-1974 or AATCC 16E-1976 requirements for light fastness of class 4 minimum at 40 hours.
6. All fabrics shall meet the brush pill ASTM D3511.3-4 minimum; Breaking strength ASTM D3597-D1682-64 (1975) 50 lbs. minimum in warp and weft; Seam Slippage ASTM D3597-D434-75 25 lbs. minimum in warp and weft.
7. All fabrics shall meet colorfastness requirement of AATCC 8-1974 dry crocking, class 4 minimum and wet crocking, class 3 minimum.

E. FINISHES

1. Seating units shall be provided in the C.O.M. fabric when listed as such in the Individual Product Specifications.
2. Manufacturer shall supply fabrics where possible for warranty issues. Otherwise Dealer to provide and ship to Manufacturer for coordinated fabrication.
3. Wood finishes shall be as specified in individual specifications to match within an acceptable range the Architect’s samples as selected from the manufacturer’s standard finishes wherever possible, unless noted otherwise. Note, a custom stain may be required for substitutions if the manufacturer’s finishes are not acceptable.

F. WARRANTY

1. Provide a minimum manufacturers warranty of 10 years on all seating unit types, exclusive of fabric. Provide a minimum warranty as that indicated on individual item specifications, wherever indicated.

2.04 TABLES

A. STYLES

1. Refer to Individual Product Specifications for detailed references and pictures of table-top and base styles. Note: the pictures are for reference only and do not purport to show all of the requirements, refer to INDIVIDUAL ITEM SPECIFICATIONS AND DESCRIPTIONS for listing of all requirements. Styles of tables are as important as the construction elements. For all substitutions, the Bidder must submit as part of their request all technical and style comparison information for review.

B. CONSTRUCTION

1. Acceptable wood species for any exposed wood & edges to be stained include walnut or cherry. Veneers shall be quarter sewn or plain sliced, center matched and vertical matched.
2. Provide adjustable glides on all conference table bases.

C. DIMENSIONS

1. Refer to Individual Product Specifications for dimensions.
2. All dimensions listed are critical, unless otherwise noted.

D. RATINGS

1. All tables shall meet or exceed ANSI/BIFMA safety and performance standards. Verification of testing certificate shall be furnished upon request.

E. FINISHES

1. Wood finishes shall be as specified on individual specifications in a variation selected from the manufacturer's standard finishes to match within an acceptable range the Architect's sample, unless noted otherwise.

F. WARRANTY

1. Provide a minimum manufacturer's warranty of five (5) years on all table top and occasional tables; and 10 years on bases and structural support. Provide the minimum warranty indicated on individual item specifications, wherever indicated.

2.05 STORAGE UNITS

A. STYLES

1. Refer to Individual Product Specifications for detailed references and pictures of table-top and base styles. Note: the pictures are for reference only and do not purport to show all of the requirements, refer to INDIVIDUAL ITEM SPECIFICATIONS AND DESCRIPTIONS for listing of all requirements. Styles of tables are as important as the construction elements. For all substitutions, the Bidder must submit as part of their request all technical and style comparison information for review.

B. CONSTRUCTION

1. Provide adjustable leveler glides on casegoods.
2. Provide hardware which allows legal and letter sizes filing capability options with all file drawers.
3. File drawer's suspension shall be a high precision ball bearing suspension w/three stage full extension slides capable of allowing maximum load capacity. Box drawer suspensions shall be the same with the exception that they can be 75 % extension. Provide one adjustable divider and pencil sorter at box drawers.
4. **All drawers shall be furnished w/locks**. One key in the lock cylinder locks all drawers in the unit.
5. Drawer pulls shall be constructed and attached as to be able to withhold the weight of the drawer completely full with files.

C. DIMENSIONS

1. Refer to Individual Product Specifications for dimensions.
2. All dimensions listed are critical, unless otherwise noted.

D. RATINGS

1. All tables shall meet or exceed ANSI/BIFMA safety and performance standards. Verification of testing certificate shall be furnished upon request.

E. WARRANTY

1. Provide a minimum manufacturer's warranty of 10 years with a lifetime warranty recommended on the following items.
-Drawer glides suspension
-Locking mechanisms
-Door hinges
-Door latches/drawer pulls

PART 3 - EXECUTION

3.01 LOCATIONS AND QUANTITIES

A. Refer to Drawings for all locations and quantities.

B. Refer to attached FF&E Schedule for manufacturers, model numbers and descriptions.

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-1**
Project No:	21-007	Item Name:	Workstation

Furniture.

Manufacturer Information:

Kimball Office
99999-001-SPD0000100-0053
1600 Royal Street
Jasper, IN 47549
United States
P: 800.482.1818

Chris Watson
chris.watson@kimballinternational.com
Vendor # 0000008204

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Description:	2 person workstation cluster: Footrpint workstation, B/B file pedestal and 3 lateral files (See attached)
Top finish:	Monterey
Edge:	1/8" molded rim profile: Monterey
Base:	Metal; color - Designer White; Standard Group 1, non-metallic
Pedestal metal chassis:	Color - Designer White; Standard Group 1, non-metallic
Metal pedestal front:	Color - Designer White; Standard Group 1, non-metallic

Image for design intent only

Finishes.

MT-7 Desk Base & Pedestals

W-3 Desk Top

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Company Office	111
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-1.1**
Project No:	21-007	Item Name:	Desk

Furniture.

Manufacturer Information:

Kimball Office
99999-001-SPD0000100-0053
1600 Royal Street
Jasper, IN 47549
United States
P: 800.482.1818

Chris Watson
chris.watson@kimballinternational.com
Vendor # 0000008204

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Description:	Footprint desk, B/B file pedestal and lateral file (See attached)
Top finish:	Monterey
Edge:	1/8" molded rim profile; Monterey
Base:	Metal; color - Designer White; Standard Group 1, non- metallic
Pedestal metal chassis:	Color - Designer White; Standard Group 1, non-metallic
Metal pedestal front:	Color - Designer White; Standard Group 1, non-metallic

Image for design intent only

Finishes.

MT-7 Desk Base & Pedestals

W-3 Desk Top

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Patrol Office	149
1 Each	Patrol Supervisor Office	150
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-2**
Project No:	21-007	Item Name:	Single Wardrobe Unit

Furniture.

Manufacturer Information:

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	7300 series
Description:	HPL one door wardrobe with black metal legs, black metal trim, two pull out drawers, black metal inset pulls, shelf, closet rod, and key lock
Size:	22" W x 25" D x 72" H
Door swing:	Right hand
Laminate:	Wilsonart laminate Natural Recon 7996-38

Image for design intent only

Finishes.

HD-1 Inset Pulls

LM-2 Laminate finish

Special Instructions.

Locations.

QTY	Area	Room
3 Each	Officer Bunk Room 2	112
12 Each	Bunk Rooms	128, 131, 134, 137
15 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-3**
Project No:	21-007	Item Name:	XL Twin Metal Bed w/ Mattress

Furniture.

Manufacturer Information:

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	7300 Series
Description:	Black metal single bed with adjustable 36" x 80" E-Z lock spring - hardwareless
Size:	83" W x 40" D x 36" H
Fascia rails:	Not included
Mattress:	Twin XL mattress; vinyl cover, inverted seam; 36" x 80"

Image for design intent only

Finishes.

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Officer Bunk Room 2	112
1 Each	Officer Bunk Room 1	113
4 Each	Bunk Rooms	127, 130, 133, 136
4 Each	Bunk Rooms	128, 131, 134, 137

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-3**
Project No:	21-007	Item Name:	XL Twin Metal Bed w/ Mattress

10 Each

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-4**
Project No:	21-007	Item Name:	Single wardrobe unit

Furniture.

<u>Manufacturer Information:</u>

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model:	7300 series
Description:	HPL one door wardrobe with black metal legs, black metal trim, two pull out drawers, black metal inset pulls, shelf, closet rod, and key lock
Size:	22" W x 25" D x 72" H
Door swing:	Left hand
Laminate:	Wilsonart laminate Natural Recon 7996-38

Image for design intent only

Finishes.

HD-1 Inset Pulls

LM-2 Laminate finish

Special Instructions.

Locations.

QTY	Area	Room
3 Each	Officer Bunk Room 1	113
12 Each	Bunk Rooms	127, 130, 133, 136
15 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-5**
Project No:	21-007	Item Name:	Desk

Furniture.

<u>Manufacturer Information:</u>

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model:	7300 series
Description:	Desk with 2" square black metal frame, no drawer, HPL panels
Size:	42" W x 24"D x 30" H
Top finish:	Solid surface top; Corian, color - Natural Gray; 42" x 24" x 1" - finished on all four sides; DBL pencil edge; 1/2" Corian on 1/2" substrate with solid 1" Corian perimeter
Laminate:	Wilsonart laminate Natural Recon 7996-38

Image for design intent only

Finishes.

LM-2 Laminate finish

SS-2 Solid Surface Top

Special Instructions.

Locations.

QTY	Area	Room
4 Each	Bunk Rooms	127, 130, 133, 136
4 Each	Bunk Rooms	128, 131, 134, 137
8 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-6**
Project No:	21-007	Item Name:	Desk

Furniture.

Manufacturer Information:

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	7300 series
Description:	Desk with 2" square black metal frame, no drawer, HPL panels
Size:	60" W x 24" D x 30" H
Top finish:	Solid surface top; Corian, color - Natural Gray; 60" x 24" x 1" - finished on all four sides; DBL pencil edge; 1/2" Corian on 1/2" substrate with solid 1" Corian perimeter
Laminate:	Wilsonart laminate Natural Recon 7996-38

Image for design intent only

Finishes.

LM-2 Laminate finish

SS-2 Solid Surface Top

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Officer Bunk Room 2	112
1 Each	Officer Bunk Room 1	113
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-7**
Project No:	21-007	Item Name:	Underbed Storage Unit

Furniture.

<u>Manufacturer Information:</u>

New England Woodcraft
481 North Street
PO Box 165
Forest Dale, Vermont 05745
United States
P: 802.247.8211

Rob Felkl
rfelkl@newoodcraft.com

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model:	7300 series
Description:	HPL underbed storage unit with 3 drawers, black PVC edgebanded ends, black inset metal pulls, and key locks
Size:	78" W x 25" D x 11" H
Laminate:	Wilsonart laminate Natural Recon 7996-38

Image for design intent only

Finishes.

HD-1 Inset Pulls

LM-2 Laminate finish

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Officer Bunk Room 2	112
1 Each	Officer Bunk Room 1	113
4 Each	Bunk Rooms	127, 130, 133, 136
4 Each	Bunk Rooms	128, 131, 134, 137

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CG-7**
Project No:	21-007	Item Name:	Underbed Storage Unit

10 Each

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-1**
Project No:	21-007	Item Name:	Bench

Furniture.

Manufacturer Information:

Leland
99999-001-SPD0000100-0029
5695 Eagle Drive, SE
Grand Rapids, MI 49512
United States
P: 800-859-7510
http://lelandinternational.com/
Rachel Straub
rstraub@mainsolutionsllc.com
Vendor # 0000555625

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Dimensions:	71" W x 22" D x 22" SW x 18" - 18.25" SH with onlay
Model:	Cricket 3 Position Linear Base
Connector Option:	No connecting ends
Seat finish:	Natural White Oak #12; To match Wilsonart laminate Natural Recon 7996-38
Beam finish:	Sterling ST metal

Image for design intent only

Finishes.

MT-1 Metal Base for Bench

W-1 Veneer Seat for Bench

Special Instructions.

1. TAG ALL ITEMS WITH THE SPECIFIED ITEM NUMBER AND PROJECT NAME.

Locations.

QTY	Area	Room
1 Each	Lobby	101
1 Each	Patrol Lobby	146
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-2**
Project No:	21-007	Item Name:	Recliner

Furniture.

Manufacturer Information:

DreamSeat
150 Motor Parkway
Suite 200
Hauppauge, NY 11788
United States
P: 631-656-1066

Phil Catalani

Vendor # Contact: Phil Catalani | Direct Line: 631-212-0254

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Item code:	XZ418301RHTBLK
Description:	Home Theater Recliner
Leather color:	Black

Image for design intent only

Finishes.

Special Instructions.

1. Customizations: Custom logo for Gillem Public Safety Building to be incorporated on inner headrest cushion

Locations.

QTY	Area	Room
8 Each	Dayroom	106
8 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-3**
Project No:	21-007	Item Name:	Dining Side Chair

Furniture.

Manufacturer Information:

Keilhauer

1450 Birchmount RD
Toronto Ontario, M1P 2E3
Canada
P: 416.759.5665
www.keilhauer.com
Rachel Straub
rstraub@mainsolutionsllc.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	Trua 65160
Dimensions:	20" W x 21" D x 32.5" H x 18.5" SH
Shell:	Standard shell 15 - Solid black
Legs:	PC00 Nickel
Arms:	Armless

Image for design intent only

Finishes.

MT-2 Metal Legs

P-1 Black Plastic Shell

Special Instructions.

Locations.

QTY	Area	Room
10 Each	Dining	107
10 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-4**
Project No:	21-007	Item Name:	Side Chair

Furniture.

Manufacturer Information:

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	Lumin Four Leg Chair/Part #: 1011 FT1 A0 PS SC19 GL1 FC2 AC
Size:	21.2" overall width x 21.6" overall depth x 33.4" overall height
Style:	Plastic seat and back
Frame finish:	Silver FC2
Plastic shell:	Red SC19
Arm style:	Armless
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

MT-3 Metal Legs

P-2 Red Plastic Shell

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Triage	104
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-5**
Project No:	21-007	Item Name:	Task Chair

Furniture.

Manufacturer Information:

Herman Miller
99999-001-SPD0000100-0036
855 East Main Street
Zeeland, MI 49464
United States
P: 616 654 3000
c/o Carithers Wallace Courtenay
Terry Whitman
terry.whitman@c-w-c.com
Vendor # SWC60748

Dealer Information:

C-W-C Office Furnishings
4343 Northeast Expressway

Atlanta, GA 30340
United States
P: 770.493.8200
https://www.c-w-c.com/
Tamara Jenkins
tamara.jenkins@c-w-c.com

Product Information:

Model/Part #:	Celle Task Chair with standard tilt/ Part #: CJ121AFUC--AJ-G1-BB-G1-BK-ZAT14
Size:	29 1/2" overall width x 15 1/2" - 18" seat depth x 44" max height
Back:	Cellular suspension back/ Graphite G1
Frame/Base Finish:	Graphite G1
Seat Vinyl:	Collection: Article 458600; color - 014 Storm
Arm style:	Fully adjustable arms
Lumbar support:	Adjustable

Image for design intent only

Finishes.

P-6 Back, Frame & Base Finish

U-5 Vinyl Seat

Special Instructions.

Locations.

QTY	Area	Room
4 Each	Watch / Reports Room	102
2 Each	Company Office	111
2 Each	Patrol Office	149

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-5**
Project No:	21-007	Item Name:	Task Chair

1 Each	Patrol Supervisor Office	150
9 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-6**
Project No:	21-007	Item Name:	Guest Chair

Furniture.

Manufacturer Information:

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	Lumin Four Leg Chair/Part #: 1011 FT1 A147 US SC18 VG2 GL1 FC2 AC
Style:	Upholstered seat with plastic back
Frame finish:	Silver FC2
Back plastic shell:	Sterling SC18
Vinyl seat:	Pattern: Element; Color: H2O
Arm style:	Fixed arms
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

MT-3 Metal Legs

P-3 Gray Plastic Shell

U-3 Vinyl seat

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Patrol Supervisor Office	150
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-6.1**
Project No:	21-007	Item Name:	Guest Chair

Furniture.

<u>Manufacturer Information:</u>

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model/Part #:	Lumin Four Leg Chair/Part #: 1011 FT1 A147 US SC18 VG2 GL1 FC2 AC
Style:	Upholstered seat with plastic back
Frame finish:	Silver FC2
Back plastic shell:	Sterling SC18
Vinyl seat:	Pattern: Element; Color: Ruby
Arm style:	Fixed arms
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

MT-3 Metal Legs

P-3 Gray Plastic Shell

U-4 Seat Vinyl

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Company Office	111
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-7**
Project No:	21-007	Item Name:	Side Chair

Furniture.

<u>Manufacturer Information:</u>

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model/Part #:	Baja Four Leg Chair/Part #: 1171 FT1 BK4 AR0 US SC23 VG2 GL1PB FC2 AC
Size:	22" Overall Width x 22.5" Overall Depth x 45" Overall Height
Style:	Upholstered seat with plastic back
Frame finish:	Silver FC2
Shell color:	Tangerine SC23
Vinyl seat:	Pattern: Slide; Color: Smoky
Arm style:	Armless
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

MT-3 Metal Legs

P-5 Orange Plastic Shell

U-1 Vinyl seat fabric

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Officer Bunk Room 1	113
4 Each	Pod A Bunk Rooms	127, 128, 130, 131
5 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-7.1**
Project No:	21-007	Item Name:	Side Chair

Furniture.

Manufacturer Information:

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	Baja Four Leg Chair/Part #: 1171 FT1 BK4 AR0 US SC5 VG2 GL1PB FC2 AC
Size:	22" Overall Width x 22.5" Overall Depth x 45" Overall Height
Style:	Upholstered seat with plastic back
Frame finish:	Silver FC2
Shell color:	Navy SC5
Vinyl seat:	Pattern: Slide; Color: Smoky
Arm style:	Armless
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

MT-3 Metal Legs

P-4 Blue Plastic Shell

U-1 Vinyl seat fabric

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Officer Bunk Room 2	112
4 Each	Pod B Bunk Rooms	133, 134, 136, 137
5 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-8**
Project No:	21-007	Item Name:	Conference Chair

Furniture.

Manufacturer Information:

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	Relay Nester/Part #: 94UX UP A60 SC18 VG2 C13 S AC
Size:	25.75" overall width x 25.25" overall depth x 33.5" overall height
Style:	Upholstered seat and back
Vinyl seat and back:	Pattern: Element; Color: Charcoal
Shell color:	Sterling SC18
Frame color:	Silver S
Arm style:	Fixed arms
Casters:	Carpet casters

Image for design intent only

Finishes.

MT-3 Metal Legs

P-3 Gray Plastic Shell

U-2 Vinyl seat

Special Instructions.

Locations.

QTY	Area	Room
16 Each	Shared Conference	147
16 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-9**
Project No:	21-007	Item Name:	Outdoor Picnic Table

Furniture.

<u>Manufacturer Information:</u>

Landscape Forms
7800 E. Michigan Ave.

Kalamazoo, MI 49048
United States
P: 800-521-2546
www.landscapeforms.com
Sohum Naik
sohumn@landscapeforms.com
Vendor # Tax ID# 38-1897577

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model:	Gretchen Picnic Table
Size:	54" W x 58" D x 30" H
Wood:	Polysite; color - Bark
Base:	Powdercoated metal; color - Black (Gloss)
Mounting:	Freestanding

Image for design intent only

Finishes.

MT-4 Powdercoated Metal Base (Gloss)

W-2 Polysite Surface

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Covered Patio	160
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-10**
Project No:	21-007	Item Name:	Outdoor Bench

Furniture.

<u>Manufacturer Information:</u>

Landscape Forms
7800 E. Michigan Ave.

Kalamazoo, MI 49048
United States
P: 800-521-2546
www.landscapeforms.com
Sohum Naik
sohumn@landscapeforms.com
Vendor # Tax ID# 38-1897577

<u>Dealer Information:</u>

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

<u>Product Information:</u>

Model:	Gretchen Bench with back
Size:	72" W x 25" D x 32" H
Wood:	Polysite; color - Bark
Base:	Powdercoated Metal Base (Gloss)
Mounting:	Freestanding
Arm style:	Armless

Image for design intent only

Finishes.

MT-4 Powdercoated Metal Base (Gloss)

W-2 Polysite Surface

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Covered Patio	160
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**CH-11**
Project No:	21-007	Item Name:	Stool

Furniture.

Manufacturer Information:

Exemplis / Sit On It
99999-001-SPD0000100-0029
6415 Katella Avenue
Cypress, CA 90630
United States
P: 714-995-4800
www.sitonit.com
Jeff DellaMaggiora
jeff@completecf.com
Vendor # 901033

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	Lumin Counter Stool; Part #: 1011 FT1 A0 US VG2 SC18 GL1 S9 FC2 AC
Size:	21.3 overall width x 22.1" overall depth x 40" overall height x 24.25" seat height
Style:	Upholstered seat with plastic back
Frame finish:	Silver FC2
Plastic back shell finish:	Sterling SC18
Vinyl seat:	Pattern: Slide; color - Smoky
Arm style:	Armless
Stool kit:	Counter height stool (24")
Glides:	Standard multi-surface glides

Image for design intent only

Finishes.

P-3 Gray Plastic Shell

U-1 Vinyl seat fabric

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Patrol Lobby	146
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**MS-4**
Project No:	21-007	Item Name:	Trash Receptacle

Furniture.

Manufacturer Information:

Landscape Forms
7800 E. Michigan Ave.

Kalamazoo, MI 49048
United States
P: 800-521-2546
www.landscapeforms.com
Sohum Naik
sohumn@landscapeforms.com
Vendor # Tax ID# 38-1897577

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	Gretchen Litter Receptacle
Size:	23" Dia x 35" H
Capacity:	25 Gal
Mounting:	Freestanding
Wood:	Polysite; color - Bark
Opening:	Top opening
Opening material:	Powdercoated metal (Gloss); color - black

Image for design intent only

Finishes.

MT-4 Powdercoated Metal Base (Gloss)

W-2 Polysite Surface

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Covered Patio	160
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**TB-1**
Project No:	21-007	Item Name:	Dining Table

Furniture.

Manufacturer Information:

Keilhauer

1450 Birchmount RD
Toronto Ontario, M1P 2E3
Canada
P: 416.759.5665
www.keilhauer.com
Rachel Straub
rstraub@mainsolutionsllc.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	Syz 10683
Size:	Rectangle: 120" W x 44" D x 29" H
Table top:	Quartz top; color - Blizzard BLZ
Legs:	PA00 - Polished Aluminum

Image for design intent only

Finishes.

QT-1 Quartz Top

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Dining	107
1 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**TB-2**
Project No:	21-007	Item Name:	Training Tables

Furniture.

Manufacturer Information:

CF Group D.B.A. Falcon Products
99999-001-SPD0000100-0017
810 West Hwy 25/70
Newport, TN 37821
United States
P: 423.632.0031

Rachel Straub
rstraub@mainsolutionsllc.com
Vendor # 0000047978

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	ASC-T Ascent Tilt/Part #: 1440
Size:	27.5" x 60" x 29.25" H
Top/Edge:	1440, 1.25" flat PVC edge band
Top finish:	Grade 1 laminate; Formica, 8826-58 Neutral Twill; matte finish
Edge finish:	Standard; Edge #13333/VFL, color - #P3 Dusk
Base finish:	Chrome
Power:	None

Image for design intent only

Finishes.

E-1 Table Edge

LM-1 Laminate Top

MT-6 Chrome Legs

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Shared Conference	147
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**TB-2.1**
Project No:	21-007	Item Name:	Training Tables

Furniture.

Manufacturer Information:

CF Group D.B.A. Falcon Products
99999-001-SPD0000100-0017
810 West Hwy 25/70
Newport, TN 37821
United States
P: 423.632.0031

Rachel Straub
rstraub@mainsolutionsllc.com
Vendor # 0000047978

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	ASC-T Ascent Tilt/Part #: 1440
Size:	27.5" x 72" x 29.25" H
Top/Edge:	1440, 1.25" flat PVC edge band
Top finish:	Grade 1 laminate; Formica, 8826-58 Neutral Twill; matte finish
Edge finish:	Standard; Edge #13333/VFL, color - #P3 Dusk
Base finish:	Chrome
Power:	N2PP-120 Nacre 2-power ports

Image for design intent only

Finishes.

E-1 Table Edge

LM-1 Laminate Top

MT-6 Chrome Legs

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Shared Conference	147
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**TB-2.2**
Project No:	21-007	Item Name:	Training Tables

Furniture.

Manufacturer Information:

CF Group D.B.A. Falcon Products
99999-001-SPD0000100-0017
810 West Hwy 25/70
Newport, TN 37821
United States
P: 423.632.0031

Rachel Straub
rstraub@mainsolutionsllc.com
Vendor # 0000047978

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model/Part #:	ASC-T Ascent Tilt/Part #: 1440
Size:	27.5" x 72" x 29.25" H
Top/Edge:	1440, 1.25" flat PVC edge band
Top finish:	Grade 1 laminate; Formica, 8826-58 Neutral Twill; matte finish
Edge finish:	Standard; Edge #1333/VFL, color - #P3 Dusk
Base finish:	Chrome
Power:	None

Image for design intent only

Finishes.

E-1 Table Edge

LM-1 Laminate Top

MT-6 Chrome Legs

Special Instructions.

Locations.

QTY	Area	Room
2 Each	Shared Conference	147
2 Each		

Hillsman
Interior Planning & Design

Furniture Specifications

Project Name:	**Forest Park Gillem Public Safety**	Issue Date:	24 SEP 2021
Project Location:	Forest Park Gillem Public Safety 2090 Anvil Block Road Forest Park, GA, USA 30297	Item Number:	**TB-3**
Project No:	21-007	Item Name:	Storage Cabinet

Furniture.

Manufacturer Information:

KRUG
99999-001-SPD0000100-0057
421 Manitou Drive
Kitcheneron, Ontario N2C 1L5
Canada
P: 888-578-5784

Todd Krutz
todd@secontract.com

Dealer Information:

Hillsman
3000 Royal Blvd South
Suite B
Alpharetta, GA 30022
United States
P: 678-336-9119
www.hillsmaninc.com
Edgar Hillsman
edgarhillsman@hillsmaninc.com

Product Information:

Model:	Nuvo Credenza with 4 hinged laminate doors
Part number:	SP51CSS72242911
Size:	72" W x 24" D x 29" H
Top:	1/2" thick Corian grade A white glued over palette finish MDF subtop; solid surface top color - Glacier White
Laminate doors finish:	Krug standard laminate; color - Charcoal
Base:	Krug standard base: Gloss Aluminum

Image for design intent only

Finishes.

LM-3 Laminate

SS-1 Solid Surface Top

Special Instructions.

Locations.

QTY	Area	Room
1 Each	Dayroom	106
1 Each		

END OF SECTION 12 40 00

SECTION 21 00 00
FIRE SUPPRESSION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for the sprinkler system and fire service piping to the building.

1.02 RELATED SECTIONS

A. Section 21 00 10 General Provisions – Fire Suppression

B. Section 21 01 00 Operation and Maintenance of Fire Suppression

C. Section 21 05 00 Common Work Results for Fire Suppression

D. Section 21 05 53 Identification for Fire Suppression Piping and Equipment

E. Section 21 10 00 Pipe, Fittings and Accessories – Fire Suppression

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. All submittals of catalog materials shall be complete and bound in a folder with the job name and the name of the installing contractor on the cover. Piecemeal and incomplete submittals are not acceptable.

C. Catalog material shall be clearly and neatly marked to show applicable model numbers and options. Any deviations or substitutions from specified material requirements shall be specifically identified in a summary sheet at the front of the submittal. Materials not relevant to the job shall be deleted or clearly marked. Piping submittals shall indicate the material qualities and wall thickness schedules to be used.

D. Submit catalog data on the following:

1. Alarm valves and trim
2. Piping and fittings - above ground and underground
3. Pipe hangers
4. Couplings
5. Sprinklers
6. Valve cabinets
7. Air Compressor(s)
8. In-Building riser
9. Fire department connection
10. Waterflow switches
11. Valve monitor switches

E. Submit sprinkler working plans drawn to a minimum scale of 1/8" = 1'0". Drawings and calculations shall meet the requirements outlined in NFPA 13 Chapter 27 *Plans and Calculations* and include the following information:

1. Type, temperature ratings, and locations of all sprinklers
2. Location of mechanical equipment with defined service access areas.
3. The location and size of the remote area of coverage including number of sprinklers calculated, hazard classification, flow and pressure requirements as determined by hydraulic calculations.
4. Show pipe lengths, hanger locations, and pipe distances from column centerlines, in addition to all data required by NFPA 13.

F. Submit complete hydraulic calculations for all piping. Hydraulically calculated pipe sizes shall be shown.

G. Working plans shall be approved and stamped by the insurer's agent prior to submission to the Architect.

H. Reflected ceiling plans shall be included indicating coordination of all sprinklers with lighting, diffusers, and ceiling types.

I. Submit a letter with the catalog data and working plan submittals certifying that welders and welding procedures meet the requirements of AWS D10.9.

J. After installation, inspection, and tests are complete, submit to the Architect. Material and Test Certificates as required by NFPA 13 with all data typed in and bearing the required signatures. A copy of these approved certificates shall be turned over to the Owner with other maintenance data.

K. Provide manufacturer’s instructions, indicate installation and support requirements.

L. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

M. Grooved joint couplings and fittings shall be shown on drawings and product submittals and shall be specifically identified with the applicable manufacturer's style or series number.

N. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

O. Provide schematic of heat trace system layout that is specific to the project.

1.04 QUALITY ASSURANCE

A. All work shall be in strict accordance with Clayton County requirements, and the following, including the latest Georgia State Fire Commissioner’s Rules and Regulations:

1. NFPA 13 – 2019 Edition, Standard for the Installation of Sprinkler Systems.
2. NFPA 24 - 2019 Edition, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
3. NFPA 25 - 2017 Edition, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
4. Chapter 120-3-3 *Rules and Regulations for the State Minimum Fire Safety Standards*

B. The system shall be installed by an experienced firm regularly engaged in the installation of sprinkler systems. The installing firm shall have a current Certificate of Competency from the Georgia State Fire Marshal's office.

C. All work shall be in accordance with (owner's insurance underwriter) (Factory Mutual) (Industrial Risk Insurers) requirements and shall be reviewed by said agency prior to being submitted to the Architect.

D. All shop drawings to be submitted to the local and/or state authority for review prior to submittal to the Architect.

E. All products and components installed in the system shall be Factory Mutual approved and listed by Underwriters Laboratories.

F. All welders and procedures shall be qualified according to the American Welding Society Standard AWS D10.9 Level AR-3 and a written record of this qualification shall be submitted.

G. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same manufacturer as the grooved components.

1.05 SPRINKLERED AREA

A. All portions of the building shall be sprinkled, unless specifically noted herein not to be sprinklered.

B. Areas subject to freezing (such as vestibules, canopies, walk-in coolers, or overhangs) shall be protected with dry pendent/sidewall sprinklers extended from the wet sprinkler system, unless other systems are specifically noted. Where dry type sprinklers cannot be installed, design shall include an auxiliary dry pipe system with control valve, strap on air compressor and dry pipe sprinklers.

C. All electrical closets shall be sprinkled unless specifically noted otherwise herein. Such rooms and spaces shall have smoke detectors. Provide sheet metal shielding below piping and sprinklers to protect sensitive electrical gear in these critical spaces from water discharge. Sleeve all piping routed thru switchgear rooms.

Exception - Sprinklers shall not be required in electrical equipment rooms where ALL of the following conditions are met:

1. The room is dedicated to electrical equipment only.
2. Only dry-type or liquid-type with listed K-class fluid electrical equipment is used.
3. Equipment is installed in a 2-hour fire-rated enclosure including protection for penetrations.
4. Storage is not permitted in the room.

1.06 BASIS OF DESIGN

A. Occupancy Type(s):

1. **A-3** Assembly
2. **B** Business
3. **S-1** Storage Moderate-Hazard
4. **S-2** Storage Low-Hazard

B. Design Approach:

1. **Light Hazard** - Offices, Bathrooms, Break Rooms, Corridors, etc.:

   a. Density: 0.10 gpm/sqft over a 1,500 sqft area of operation.
   b. Sprinkler K-Factor: 5.6 or larger
   c. Sprinkler Type: Pendent, Standard/Extended Coverage*, Quick Response.
   d. Sprinkler Temperature Rating: minimum 150 deg. F
   e. Spacing: maximum protection area of 225 sqft/sprinkler.
      Small Room Rule (per **NFPA 13: 10.2.5.2.3**): permissible

      *Extended Coverage: spaced per **NFPA 13: Table 11.2.2.1.2**

2. **Ordinary Hazard Group I** - Mechanical Rooms, Electrical Rooms, Small Storage Rooms, Janitor's Closets, Copier/Workroom:

   a. Density: 0.15 gpm/sqft over a 1,500 sqft area of operation.
   b. Sprinkler K-Factor: 5.6 or larger
   c. Sprinkler Type: Pendent and/or Upright, Ordinary Hazard, Quick Response (per **NFPA 13: 9.4.3.2**) or Standard Response.
   d. Sprinkler Temperature Rating: minimum 150 deg. F (per **NFPA 13: 9.4.2.7**)
   e. Spacing*: maximum protection area of 130 sqft per sprinkler (per **NFPA 13: Table 10.2.4.2.1(b)**)

      *Extended Coverage: spaced per **NFPA 13: Table 11.2.2.1.2**

3. **Ordinary Hazard Group I** – Service Drive, Automobile parking and showrooms (per **NFPA 13: A.5.3.1**):

   a. Density: 0.15 gpm/sqft over a 1,500 sqft area of operation.
   b. Sprinkler K-Factor: 5.6 or larger (per **NFPA 13: 12.6.1**)
   c. Sprinkler Type: Pendent and/or Upright, Ordinary Hazard, Quick Response (per **NFPA 13: 9.4.3.2**) or Standard Response.
   d. Sprinkler Temperature Rating: minimum 150 deg. F (per **NFPA 13: 9.4.2.7**)
   e. Spacing*: maximum protection area of 130 sqft per sprinkler (per **NFPA 13: 10.2.4.2.1(b)**)

      *Extended Coverage: spaced per **NFPA 13: Table 11.2.2.1.2**

4. **Extra Hazard Group I** - Storage - Motor Vehicle (Apparatus Bay):

   a. Density: 0.30 gpm/sqft over a 2,500 sqft area of operation.
   b. Sprinkler K-Factor: 11.2
   c. Sprinkler Type: Pendent, Ordinary Hazard, Quick Response.
   d. Sprinkler Temperature Rating: minimum 175 deg. F

C. All piping shall be hydraulically sized for the available water supply based on sprinkler demands. Flow test data shall be obtained by the installing contractor and submitted to project engineer/designer prior to generating shop drawings. Flow test data:

Date: 6/10/2021

Time: 23:00
Water main size: n/a
Static: 70 psi
Residual: 60 psi
Flow: 1,840 gpm
Static Hydrant: Anvil Block just south of Cub Drive
Flowing Hydrant: Next hydrant south of Static hydrant

D. A complete set of hydraulic calculations shall be submitted based on the final piping layout. Final hydraulic calculations shall be based on a maximum required pressure at flow conditions 15 psi below the curve established by the flow test data. Allow (250 gpm for Ordinary Hazard Occupancies) and (100 gpm for Light Hazard Occupancies) hose allowance assigned at the base of the sprinkler riser in calculations.

E. Calculations shall be based on sprinkler "K" factors of 5.60 for a 1/2" orifice, 8.0 for a 17/32" orifice, 11.2 and 25.2 for a 5/8" orifice. No more than four fittings shall be used in the drop nipples to pendent sprinklers.

F. Provide additional fittings and offsets as required to coordinate the work with other trades.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Unless noted otherwise, all materials shall be new and free from defects.

B. Materials and equipment used for similar application shall be the products of one manufacturer unless noted otherwise.

2.02 UNDERGROUND PIPE AND FITTINGS

A. Underground pipe: underground piping shall be ductile iron.

B. Ductile iron pipe: thickness class 50 with cement lining and bituminous coating, meeting FM 1610 *Ductile Iron Pipe and Fittings, Flexible Fittings and Couplings*, and ANSI A21.51. Joints shall be gasketed slip-on type, meeting ANSI A21.11.

C. Underground fittings: underground fittings shall be cement-lined cast iron with mechanical joint connections. Working pressure shall be 250 psig. Fittings shall meet FM 1620 *Pipe Joints and Anchor Fittings for Underground Fire Service Mains*, ANSI A21.10 and A21.11.

D. Tie rods and clamps: carbon steel rods with bituminous coatings. Provide 3/4" tie rods, bolts, and washers.

E. Underground gate valves: valves shall be suitable for use with an indicator post (PIV) or roadway box as noted on the drawings. Valves shall be non-rising stem gate valves with cast iron body, bronze mountings, and mechanical joint connections. Valves with indicator post shall have an indicator post flange. Valves shall open counterclockwise.

F. In-Building Riser (aka Transition Riser): designed in accordance to NFPA 24, the factory-tested riser shall be composed of a single 90-degree fitting of fabricated 304 stainless steel tubing with a maximum working pressure of 200 psi. The In-Building Riser shall be an Ames Fire and Waterworks Series IBR, or a Watts Series TR, or a Zurn Model WBR.

1. Inlet (underground side): Coupler shall be Push-On AWWA C900 (PVC or ductile iron pipe) and brackets shall be provided for pipe installation equipment attachment points.
2. Outlet (building side): shall meet AWWA C606 dimensions for roll-grooved pipe.
3. Pipe Wrap: entire length of fitting shall be primed and wrapped in minimum 4" wide, 20 mil thick, high-tack, corrosion resistant PVC tape which meets IAPMO PS 37-90. Acceptable manufacturers are: NADCO Product # PWT-20, or PASCO Part # 9064-R.

2.03 ABOVEGROUND PIPE AND FITTINGS

A. Above ground pipe shall be black steel:

1. For wet pipe systems piping shall be black steel to meet ANSI/UL 852 *Metallic Sprinkler Pipe for Fire Protection Service*, FM-1630, ASTM A795, ASTM A-135 or ASTM A-53. All pipe less than Schedule 40 shall meet ASTM A-135. All pipe 1-1/4" and smaller shall be Schedule 40. All pipe lighter than Schedule 30 shall be all be UL listed and FM approved and shall be joined by welding or Victaulic roll grooved couplings only (no threaded joints). Acceptable manufacturers are: Youngstown Tube Co., Allied Tube and Conduit, Wheatland Tube Co., Northwest Pipe Company, Paragon Industries Inc., Tex-Tube Company, and Bull Moose Tube Company.
2. Use hot dipped zinc coated (galvanized) pipe where noted (GALV.) on the drawings and as specified hereafter.
3. Galvanized pipe shall be installed in areas exposed to weather or corrosive conditions (i.e. pools, pool chemical storage, chemical storage, exterior piping etc.) and shall meet ASTM A-123 and ASTM A795/A795M - 13, *Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use*.
4. DRY PIPE: All grooved end galvanized steel piping systems for pre-action and/or dry pipe systems shall be cut grooved in accordance with Victaulic specifications in accordance with AWWA C606. Coupling gaskets for pre-action and dry pipe systems shall be Flush Seal (Gap) or GapSeal type and shall be provided by the coupling manufacturer.

    a. No malleable iron fittings shall be used in pneumatic (dry or preaction) piping systems.

B. Malleable iron threaded fittings Class 150 and 300: material shall conform to ASTM A197, dimensions shall conform to ASME B16.3, NPT threads shall conform to ASME B1.20.1. Acceptable manufacturers are Anvil ("SPF"), Allied Rubber & Gasket Co. (ARGCO), Sigma, Smith-Cooper ("SCI"), Tyco, Ward Manufacturing LLC, or approved equivalent.

C. Ductile iron threaded fittings: castings shall conform to ASTM A536, dimensions shall conform to ASME B16.3, NPT threads shall conform to ASME B1.20.1 and rated to 300# WSP. Acceptable manufacturers are Smith-Cooper ("SCI"), AnvilStar ("SPF"), Allied Rubber & Gasket Co. (ARGCO), Sigma, Tyco, or approved equivalent.

D. Cast iron threaded fittings: Gray iron castings per ASTM A126 class B. Dimensions conform to ANSI B16.4 class 125 (plugs and bushings conform to ASME B16.14). NPT threads per ASME B1.20.1. Acceptable manufacturers are Smith-Cooper, Star, AnvilStar, Sigma, Ward Manufacturing LLC, or approved equivalent.

E. Welded fittings: Factory fabricated wrought steel buttweld fittings meeting ASTM A-234 and ANSI B16.9. U.L. listed and FM approved formed steel welding outlets may be used. Acceptable manufacturers are Wheeling Machine Products Company, Anvil, or Allied Piping Products Company.

F. Grooved joints and fittings:

1. Grooved mechanical fittings and couplings shall use an elastomeric gasket (EPDM or nitrile) enclosed by a split ductile iron housing.

   a. All wet pipe systems shall be roll-grooved type.
   b. All dry systems shall be cut groove type.
   Exception: coupling systems installed with Flush Seal (Gap) type gaskets may be roll-grooved type.

2. Ductile iron shall meet ASTM A536.
3. Self-grooving couplings and fittings employing set screws or plain end pipe shall not be used.
4. **Ductile iron grooved fittings:** coatings shall be non-lead orange paint. Acceptable manufacturers are Allied Rubber & Gasket Co. (ARGCO), AnvilStar ("SPF"), API International (KLAMPz), Munro, Reliable, Shurjoint, Sigma, Smith-Cooper ("SCI"), The Viking Corp (VGS), Tyco, or Victaulic.
5. **Rigid type couplings:** Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. 1-1/4" through 8" shall be "Installation Ready" stab-on design, for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. Acceptable manufacturers: Anvil Gruvlok 7400 S or Rigidlite 7400, Allied Rubber & Gasket Company (ARGO) Model 001, API International Model K05 KLAMPz, Dixon Valve & Coupling Co 402R, GemLock - Style 5, Reliable Automatic Sprinkler Company (RASCO) Model RRC, Shurjoint Model 7771, Smith-Cooper International (SCI) Model 65LR and/or 65SR, Viking V-Z05, Tyco Figure 577, Victaulic FireLock® EZ Style 009H (1-1/4" – 4") and QuickVic™ Style 005 (2" – 8"). 10" and larger shall be Victaulic Style 07 standard rigid coupling.
6. **Reducing couplings:** Shall be allowed only where one pipe size change occurs. Use reduction pipe fittings where change of more than one pipe size occurs. Acceptable reducing coupling manufacturers are: Allied Rubber & Gasket Company (ARGO) Model 020, Anvil International SPF RC2 or Figure 7010, Reliable Automatic Sprinkler Company (RASCO) Model RRDC, Shurjoint Model 7706, Smith-Cooper International (SCI) Model 65RC, Viking V-7706, Tyco Figure 716, and Victaulic Model 750.
7. Galvanized fittings shall be installed in all corrosive areas (i.e. areas exposed to the elements, pools, pool chemical storage, chemical storage, etc.)

G. **Mechanical tees:** shall provide a mid-point branch outlet (either threaded or grooved) without the use of multiple fittings or the welding method. A hole shall be cut or drilled – torch cutting is prohibited – before the mechanical tee is installed in accordance with the manufacturer's installation instructions. Mechanical tees shall be supplied with a Grade "E" EPDM gasket a pair of bolts and nuts. Removed pipe section shall be tethered to mechanical tee.

2.04 VALVES

A. All valves shall be by one manufacturer.

B. All valve handwheels shall be oriented to provide maximum accessibility for operation.

C. Use of quick-opening valves is not permitted on main drains or test headers.

D. Valve size, working pressure, and the manufacturer's name or trademark shall be permanently affixed to the body of all valves. Drain, test and gauge valves are exempt from this requirement.

E. "Standard weight" valves for service up to 175 psig, as follows:

1. Gate valves smaller than 2½" shall be U.L. listed OS & Y (rising stem) design with bronze body and mountings and screw connections.
2. Gate valves 2½" and larger for above ground service shall be U.L. listed OS & Y design with cast iron body, bronze mountings and flange connections. Open counterclockwise.
3. Grooved end gate valves 2½" and larger for above ground service shall be U.L. listed and FM approved OS&Y design with ductile iron body, EPDM coated cast iron disc, bronze mountings and grooved end connections. Victaulic Series 771.
4. Trim valves: gate, globe, angle, and check valves used for "trim" in the fire protection system shall have all bronze construction and screwed connections.
5. All system shut-off valves shall be electronically supervised/monitored.

F. Swing Check Valves (grooved or flanged) shall be U.L. Listed and FM Approved, non-slamming, clapper type with ductile iron body (ASTM A 536, Grade 65-45-12), or cast iron body (ASTM A 126) and have an EPDM clapper facing, and stainless steel seat ring, hinge pin, and spring, and approved for horizontal or vertical installation:

1. Smaller than 2": shall have cast bronze body (85-5-5-5), forged brass clapper, NBR (Chloramine Resistant) seat, and female/female screwed connections.
2. 2" to 5": Clapper shall be Type 304 or 302 Stainless Steel (ASTM A167 or A 240)
3. 6" to 8": Clapper shall be ductile iron (ASTM A 536, Grade 65-45-12).
4. Acceptable manufacturers are: Anvil Fig. 78FP, ARGCO ARG-CH-300 Series, FPPI, Fivalco Inc. Firecheck DGC, Globe Model RCV, NIBCO KG 900 Series, Reliable Model G, Tyco Model CV-1, United Water Products Series 8700, Victaulic Series 717, Viking Model SCG, SCF, M-2, D-1, or G-1, or Ward MFG.

G. Ball Valve: shall be full port, gear operated, lead free, slow close type. Acceptable manufacturers are:

1. Ames: model LFAFBV-FP
2. Smith-Cooper International
3. The Viking Corp: model FBV-FP
4. Victaulic
5. Watts

H. Butterfly valves shall be U.L. listed and FM approved for fire protection service. Valves 3" and larger shall be slow closing ductile iron body, flanged or grooved to fit piping system, 175 psi working pressure rated, stainless stem and ductile disc, EDPM or Viton resilient seat. Valves shall be provided with gear operation with malleable iron wheel. All valves shall be provided with a built-in tamper resistant SPDT switch for supervision of the valve position. Acceptable manufacturers are:

1. Anvil (Star Pipe aka S.P. fittings)
2. Allied Rubber & Gasket Co (ARGCO)
3. Fire Protection Products Inc. (FPPI)
4. FireWall Valve LLC: model F-W300 or F-G300
5. Fivalco Inc.

6. Gala RS Inc.
7. Global Safety
8. Globe Fire Sprinkler Corp.: Model GBV300GT
9. Kennedy
10. Landsdale International LLC
11. Milwaukee Valve Company Inc.
12. NIBCO Inc.
13. Reliable Automatic Sprinkler Co. Inc.: Model REL-BFG-300
14. Smith-Copper International
15. Tyco Model BFV-N
16. Victaulic
17. Zurn: Model 49

I. Alarm Check Valve (Riser Check Valve): Cast iron, bronze trimmed alarm check valve with vertical, variable pressure trim. Provide an exterior water or electric motor alarm. Acceptable manufactures:

1. Globe Model RCV (with electric alarm bell) and Model H
2. Reliable Model E or Model G with Trim Kit
3. Victaulic Series 751/764
4. Viking Model E-1, F-1, OR J-1
5. Shurjoint RCV
6. Tyco Model AV-1, CV-1 or CV-1FR

J. Dry Pipe Valve: Iron body, flanged, 175 psi rated with replaceable clapper assembly, complete with trim, accelerator pressure alarm switch, and low-pressure switch. Valve shall be Globe Model D, Reliable Model D, Viking Model F, or Tyco Model DPV-1, or Victaulic Series 756/768/764.

1. Pressure Switch (Water): switch shall be provided with a 1/2" NPT male pressure connection and shall be connected to the alarm port outlet of dry pipe valve. The pressure switch shall be actuated when the alarm line pressure reaches 4 - 8 psi. Pressure type waterflow switch shall have a maximum service pressure rating of 300 psi and shall be factory adjusted to operate on a pressure increase of 4 - 8 psi. Pressure switch shall have two sets of SPDT rating 10.1 Amps @ 125/250VAC or 2.0 Amps as 30VDC (verify with electrical contractor). Pressure switch shall be suitable for indoor or outdoor service with a NEMA 4/IP66 rating.
2. Pressure Switch (AIR): switch shall be provided with a 1/2" NPT male pressure connection and shall be connected into the air supply line on the system-side of any shut-off valve. Pressure switch shall have two sets of SPDT rating 10.1 Amps @ 125/250VAC or 2.0 Amps as 30VDC (verify with electrical contractor). The first switch shall be set to operate at a pressure decrease of 10 psi from normal. The second switch shall be set to operate at a pressure increase of 10 psi from normal. Pressure switch shall be suitable for indoor or outdoor service with a NEMA 4/IP66 rating.

K. Automatic Air Vent (for metallic pipe wet sprinkler systems):1/2” NPT inlet and 1/2” MNPT outlet to drain, 5/64” orifice, brass construction. Include monitored insolation 1/2" ball valve located upstream of 1/2" strainer which is separated from air vent valve by a 1/2" union. Vent shall be Potter Model PAV.

L. Test and Drain Valve: Globe style bronze body and bonnet, bronze and copper alloy internals with stainless steel spring, dual polycarbonate sight glasses, ½” orifice for test purposes (note: orifice size shall be equal to the smallest sprinkler orifice provided on the system), and stainless steel quarter-turn ball valve or a malleable iron handwheel. UL listed and FM approved for services up to a minimum of175 psi. ARGCO Model 1000, Giacomini A61, Globe Model UTD, Tyco TFP F350, Victaulic Series 720 TestMaster™ II, Viking Test and Drain Model 1000, or AGF TESTanDrain Model.

M. Remote Test and Drain Valve: Globe style bronze body and bonnet, bronze and copper alloy internals with stainless steel spring, dual polycarbonate sight glasses, ½" orifice for test purposes (note: orifice size shall be equal to the smallest sprinkler orifice provided on the system), and stainless steel quarter-turn ball valve or a malleable iron handwheel. UL listed and FM approved for services up to a minimum of 175 psi. Giacomini A61, Tyco TFP F350, Victaulic Series 720 TestMaster™ II, Viking Test and Drain Model 1000, or AGF TESTanDrain Model 3011SG.

2.05 RISER MOUNTED AIR COMPRESSOR

A. Air compressor for auxiliary dry systems shall be air-cooled, single stage, oil-less strap-on type. The air compressor shall be U.L. approved and can achieve operational air pressure within 30 minutes of discharge in accordance with NFPA 13 requirements. Provide complete with thermal overload protected motor, check valve, pressure relief valve and pressure switch. *Note: If an accelerator is required, a tank-mounted air compressor with a regulated air maintenance device shall be used* (see FLOOR MOUNTED AIR COMPRESSOR).

B. Valve shall be: GAST Manufacturing, General Air Products, C-Aire, Central, Jenny Products, Inc. (Emglo), or approved equivalent.

2.06 FLOOR MOUNTED AIR COMPRESSOR (**ALTERNATE** - IF RISER MOUNTED AIR COMPRESSOR CANNOT SATISFY **NFPA 13: 2.6.3.2**)

A. Compressor and air tank: duplex piston type sized to restore normal air pressure in 30 minutes with one compressor running. Functions of system to be complete with two compressors, factory mounted and wired starters and controls with manual lead-lag switch, automatic pressure switch, ASME relief valve, reducing valve, hand valves, drip valves, intake filter, high pressure discharge filter with automatic trap, refrigerated drier and steel air tank with automatic trap. Provide three-valve bypass with desiccant driers around refrigerated drier. Compressor shall be reciprocating type. Compressor discharge pressure shall not be less than 80 psi.

B. Manufacturer shall be: GAST Manufacturing, General Air Products, C-Aire, Central, Jenny Products, Inc. (Emglo), or approved equivalent.

2.07 SPRINKLERS

A. All sprinklers shall be listed and shall be the product of one manufacturer.

B. All sprinklers up to K-Factor 5.8 shall have 1/2" NPT threaded connections unless otherwise noted. All sprinklers with K-Factor 8.0 or greater shall have 3/4" NPT threaded connection, unless otherwise noted.

C. Sprinklers shall be listed for their specific use and of the following manufacturers: Globe Fire Sprinkler, Reliable Automatic Sprinkler, The Viking Corporation, Tyco Fire Products, or Victaulic Company. See table(s) below for FM Global approved model numbers:

	Pendent Sprinklers									
Nominal K-Factor	**Globe Fire Sprinkler Co.**		**Reliable Automatic Sprinkler Co.**		**The Viking Corp.**		**Tyco Fire Products**		**Victaulic Co.**	
	Standard	**QR**	**Standard**	**QR**	**Standard**	**QR**	**Standard**	**QR**	**Standard**	**QR**
K5.6	GL5651	GL5601	R1314	R1414	VK102	VK302	TY325*	TY323*	V2707	V2708
K5.6EC						VK600		TY3232		
K8.0	GL8156	GL8106	R1712	R3612	VK202	VK352	TY4251	TY4231	V3405	V3406
K8.0EC				R4842		VK602		TY4232		
K11.2			R2916	R3216	VK536	VK377	TY5251	TY5231	V3407	V3408
K11.2EC						VK608		TY5237	V3411	V3412
K14.0			R4613	RA1812		VK500		TY6236		V4402
K14.0EC						VK572		TY6237	V3414	
K25.2				RA0912		VK510		TY9226	V4601	
K25.2EC				RA0842						
*Tyco TY-B and TY-FRB old serial # TY3231 & TY3251										

	Recessed Pendent Sprinklers									
Nominal K-Factor	**Globe Fire Sprinkler Co.**		**Reliable Automatic Sprinkler Co.**		**The Viking Corp.**		**Tyco Fire Products**		**Victaulic Co.**	
	Standard	**QR**	**Standard**	**QR**	**Standard**	**QR**	**Standard**	**QR**	**Standard**	**QR**
K5.6	GL5651	GL5601	R1314	R1414	VK102	VK302	TY325*	TY323*	V2707	V2708
K5.6EC										
K8.0	GL8151	GL8101	R1712	R3612	VK202	VK352	TY4251	TY4231	V3405	V3406
K8.0EC				R4842		VK602		TY4232		
K11.2										
K11.2EC						VK608		TY5237	V3411	V3412
K14.0										
K14.0EC								TY6237	V3414	
*Tyco TY-B and TY-FRB old serial # TY3231 & TY3251										

Nominal K-Factor	Adjustable Concealed Pendent Sprinklers									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	"Sealing"	Standard	QR	Standard		Standard	QR
K5.6	GL5653	GL5606	R5418	R2218			TY3551	TY3531		
K5.6EC										

Nominal K-Factor	Concealed Pendent Sprinklers									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	Standard	Standard	QR	Standard	QR
K5.6	GL5654		RA3415		VK462	VK492			V3802	
K5.6EC										
K8.0					VK352					
K8.0EC										

Nominal K-Factor	Upright Sprinklers									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5661	GL5615	RA1325	RA1425	VK100	VK300	TY315*	TY313*	V2703	V2704
K5.6EC										
K8.0	GL8164	GL8118	R1722	R3622	VK200	VK350	TY4151	TY4131	V3401	V3402
K8.0EC										
K11.2			R2921	R3226	VK530	VK531	TY5151	TY5131	V3403	V3404
K11.2EC						VK532		TY5137		
K14.0						VK520				
K14.0EC								TY6137		
K25.2					VK598				V4603	
K25.2EC						VK595		TY9128		

*Tyco TY-B and TY-FRB old serial # TY3131 & TY3151

Nominal K-Factor	Horizontal Sidewall Sprinklers									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5670	GL5626	RA1335	RA1435	VK104	VK305	TY3351	TY3331	V2709	V2710
K5.6EC				RA2865				TY3332		V2758
K8.0										
K8.0EC				R4862				TY4332	V3415	V3416

Nominal K-Factor	Dry Pendent Sprinklers*									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5679	GL5635	RA5314	RA5714	VK150	VK172	TY3255	TY3235	V3605	V3606
K8.0									V3607	V3608
K11.2					VK544	VK547				
K14.0						VK502				

*Provide dry pendent sprinklers in areas with finished/drop ceilings, to minimize volume of trapped water in dry pipe systems.

Nominal K-Factor	Dry Adjustable Pendent Sprinklers*									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6					VK154	VK176				
K11.2					VK546	VK549				

*Provide dry pendent sprinklers in areas with finished/drop ceilings, to minimize volume of trapped water in dry pipe systems.

Nominal K-Factor	Dry Recessed Pendent Sprinklers*									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5679	GL5635	R5314	R5714	VK158	VK180	TY3255	TY3235	V3605	V3606
K8.0									V3607	V3608
K11.2					VK545	VK548				
*Provide dry pendent sprinklers in areas with finished/drop ceilings, to minimize volume of trapped water in dry pipe systems.										

Nominal K-Factor	Dry Adjustable Concealed Pendent Sprinklers*									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5689	GL5634								
*Provide dry pendent sprinklers in areas with finished/drop ceilings, to minimize volume of trapped water in dry pipe systems.										

Nominal K-Factor	Dry Horizontal Sidewall Sprinklers									
	Globe Fire Sprinkler Co.		Reliable Automatic Sprinkler Co.		The Viking Corp.		Tyco Fire Products		Victaulic Co.	
	Standard	QR	Standard	QR	Standard	QR	Standard	QR	Standard	QR
K5.6	GL5685	GL5641	R5334	R5734	VK152	VK174	TY3355	TY3335	V3609	V3610

D. Concealed sprinklers:

1. In all smooth-finish, gypsum ceilings and any locations noted on reflected ceiling plans.
2. In all acoustical ceilings.
3. In all exterior ceilings and/or soffits. Cover plate finish shall match ceiling and/or soffit finish (painted by manufacturer only). Provide dry adjustable concealed pendent sprinkler, if area is subject to freezing.
4. Coordinate finish with project architect.

E. Recessed sprinklers:

1. In all lay-in ceilings, unless otherwise noted. Finish shall be white painted/polyester with matching escutcheons/cover plates, unless otherwise noted.

2. In all metal, wood, wood-like ceilings. Finish shall be chrome, unless otherwise noted.
3. All escutcheons installed with recessed sprinklers shall be two-piece semi-recessed mounted.

F. Upright sprinklers:

1. Install upright sprinklers in all areas exposed to structure.
2. All upright sprinklers shall be cast brass finish, unless otherwise noted.

G. Sidewall sprinklers:

1. Finish color shall match wall finish color (painted by manufacturer only).

H. Temperature ratings shall be as recommended by NFPA 13 unless shown otherwise.

I. Install near the alarm valve a painted steel cabinet containing spare sprinklers and one sprinkler wrench. Contractor shall include at least one pair of escutcheons for each type of spare sprinkler. Proportion sprinklers as to type and temperature rating. If flexible sprinkler drops are used, provide a spare flexible drop strapped to the spare sprinkler cabinet with an additional mounting bracket and lock nuts. The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:

1. For protected facilities having under 300 sprinklers — no fewer than six sprinklers
2. For protected facilities having 300 to 1000 sprinklers — no fewer than 12 sprinklers
3. For protected facilities having over 1000 sprinklers — no fewer than 24 sprinklers

J. Install sprinkler guards on all sprinklers located within 7'-0" of finished floor. Acceptable manufacturers are: Globe Model JG, Reliable Model C-1, Tyco Model G1or Model G4, Viking Model A-1 or Model D-1, or Victaulic Model V27 or Model V34.

K. Special coatings: sprinklers installed in areas exposed to weather or corrosive conditions (i.e. pools, chemical storage, etc.) shall have a manufacturer NICOTEF (Nickel-Teflon) coating. Acceptable manufacturers: Victaulic and Viking.

L. Sprinkler escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler, by the sprinkler manufacturer.

2.08 FLEXIBLE SPRINKLER DROPS

A. In lieu of rigid pipe offsets or return bends for sprinkler drops, a flexible sprinkler drop may be used (i.e. ARGCO braided flex, EasyFlex, Fivalco, SprinkFlex, Reliable (RASCO) Flexible sprinkler drops, Victaulic VicFlex™, Viking braided flexible sprinkler connection, Tyco FASTFLEX Braided-FM, or FlexHead) provided the suspended ceiling supporting the flexible sprinkler drop meets ASTM C 635 and is installed in accordance with ASTM C 636 and the maximum unsupported length of the flex drop does not exceed 6 ft.

EXCEPTION: Flexible drops prohibited above sheetrock ceilings.

B. VicFlex Style VS1 Dry Sprinkler Model V3506 (with white painted finish):

1. The Style VS1 Dry Sprinkler's inlet MUST be installed only into the outlet of a cast or malleable iron tee that meets the dimensional requirements of ANSI B16.3 and ANSI B16.4, Class 125 and Class 150. Use a sample fitting to confirm proper engagement.
2. Style VS1 Dry Sprinklers in dry systems must be installed with a continuous downward slope along its entire length from the branch line fitting to the sprinkler. No localized low points shall be present along the length of the Style VS1 Dry Sprinkler.
3. Style VS1 Dry Sprinklers are not permitted to be installed into the top of the branch line piping. Style VS1 Dry Sprinklers must be installed into the side or from the bottom of the branch line piping.

C. The drop system shall consist of a fully braided type 304 stainless steel flexible tube, a zinc plated steel 1" NPT male threaded nipple for connection to branch-line piping, and a zinc plated steel reducer with a 1/2" or 3/4" NPT female thread for connection to the sprinkler head.

D. The flexible drop must be listed for a minimum of three 90-degree bends to assure proper installation. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate bracket (the bracket shall allow for sprinkler installation before or after the bracket is secured to the sprinkler grid). The braided drop system is FM Approved for sprinkler services to 175 psi and can be installed without the use of proprietary tools, and the corrugated system is UL Listed for sprinkler services to 175 psig. All hoses shall be factory-pressure tested to a minimum of 400 psi.

E. Equivalent lengths: shall be based on FM approved equivalent lengths for submitted flexible hose length. Flexible hose length (or lengths) shall be specifically indicated in both the product data submittal and on the shop drawing(s).

2.09 FIRE DEPARTMENT SIAMESE CONNECTION

A. Free-standing, 2-way, double-clapper with lockable FDC plugs shall consist of two 2.5" connections using NH internal threaded swivel fittings with "2.5--7.5 NH standard thread," as specified in NFPA 1963. Finish shall be rough brass. Acceptable manufacturers: Potter Roemer, Wilson & Cousins IE34D, Elkhart Brass, Fire Protection Products Inc. (FPPI), Guardian Model 6325, and Dixon Valve & Coupling Co. Provide the following:

B. Escutcheon plate lettered "AUTO SPKR"

C. Two brass plugs and chains.

D. Freestanding FDC shall drain into an accessible dry well, or directly over the backflow preventer vault, and be installed with a fixed identification sign and have a minimum of 3 feet clearance from obstructions per the International Fire Code. If the FDC in not readily visible from the front, a sign shall be provided to direct the fire department to the FDC. Any underground check valves on FDC piping shall be accessible. Contractor shall install a means for drainage of water trapped in underground piping. If necessary, include a ball-drip within a vault or pea gravel. Method must be approved by project engineer prior to installation.

E. FDC Plug - solid stainless-steel construction, 2.5" NH. Knox FDC Plug with Swivel-Guard™ option or approved equivalent.

2.10 HANGERS AND SUPPORTS

A. The installation and spacing of hangers for sprinklers shall conform to NFPA 13.

B. Hangers and supports shall be U.L. listed and FM approved and suitable for the structural system as recommended by the manufacturer.

C. Piping smaller than 8" shall be supported by galvanized steel, adjustable, flat band hangers. Acceptable manufacturers are AFCON model 300, Anvil Fig. 69, Globe Pipe Hanger 300 Series, PHD Manufacturing, Inc., ERICO Caddy, B-Line, Inc. (TOLCO), or approved equivalent.

D. Piping 8" and larger shall be supported by galvanized steel, adjustable, clevis hangers.

E. Sprinkler piping below ductwork shall not be supported directly from the ductwork, but by trapeze hangers or angles conforming to NFPA 13.

2.11 ALARM AND SUPERVISORY DEVICES

A. Alarm switch for wet pipe systems: Vane-type flow switch with flexible vane, SPDT contacts, cast aluminum housing with red enamel finish, and a steel U-bolt. The switch shall have an instantly recycling pneumatic retard mechanism field adjustable from 0-60 seconds. Minimum water working pressure shall be 175 psi.

B. Valve tamper switch: Suitable for PIV alarm, or zone valves. A signal shall be initiated before the valve stem moves more than 1/5 of its total travel or if the housing cover is removed.

C. Alarm Bell: provide 6 in. (minimum), 24 VDC, listed for indoor or outdoor use, with red powder-coated finish and standard 4” square weather-proof electrical mounting box.

D. Aluminum jackets shall be stucco embossed type, .010" thick for pipe 8" and under, and .016" thick for 10" and over. Provide two-piece pre-formed aluminum stucco embossed jackets at fittings.

PART 3 – EXECUTION

3.01 UNDERGROUND PIPE AND ACCESSORIES

A. Underground pipe shall have not less than 36" cover.

B. Excavate the trench bottom around pipe joints so that the pipe rests on solid ground along its entire length.

C. Rock, sand, unstable soil, or material unsuitable to bear pipe shall be excavated to a minimum depth of 6" below the bottom of the pipe and the space filled with gravel.

D. Pipe trenches shall be backfilled and tamped in 6" layers until the crown of the pipe has been covered. Backfill shall contain no rocks, refuse, or cinders.

E. Underground pipe shall terminate in the building with a flanged cast iron transition piece rodded to the underground pipe. Space between the pipe and wall shall be filled with non-shrink grout. Where pipe passes through the building wall below outside grade, provide a cast iron sleeve and fill the annular space between pipe and sleeve with a "Link-Seal" mechanical type, synthetic rubber seal manufactured by GPT Industries.

F. Prior to covering the joints of underground pipe, the pipe shall be hydrostatically per NFPA 24. The municipal water main and the plumbing system shall be isolated for this test.

G. Changes in direction exceeding 22.5 degrees shall be anchored with thrust blocks, tie rods, and clamps per NFPA 24.

H. Underground piping systems for city water applications may utilize Victaulic grooved mechanical couplings and fittings for joining AWWA dimensioned ductile iron pipe, minimum Class 53, with radius cut grooved ends conforming with Victaulic grooving specifications in accordance with ANSI/AWWA C606.

I. To minimize erosion/washout, provide splashguard at each exterior drain location where drain terminates over natural grade (i.e. sod, planting bed).

3.02 INSIDE PIPING AND EQUIPMENT

A. Fire protection valves shall be accessible and shall not be located in the fire area they control. Valves should be in an area easily accessible under all conditions. Locations above suspended ceilings shall be avoided except for valves which control a single sprinkler (i.e. elevator pit sprinkler). Fire protection valves shall be located in stairwells, or in stacked sprinkler or mechanical spaces which permit ready access and floor to floor riser piping. Fire protection valves shall not be located in custodial closets or customer closets or conference rooms. If no other option is available, valves located above ceilings shall be accessible and labeled on the ceiling grid or access panel.

B. Route sprinkler piping to provide a finished system located above finished ceilings, where ceilings are installed.

C. DO NOT route new sprinkler piping under HVAC units or within HVAC unit service access, coordinate with mechanical contractor for unit locations prior to beginning work.

D. Run pipe parallel to column centerlines. Pipe shall generally be installed as high as possible to maintain maximum headroom. Provide auxiliary drains as needed to drain all portions of the piping systems.

E. Piping arrangements shall be made as compact as possible. Spool pieces and pipe nipples shall be as short as installation with allow.

F. All piping shall be routed to provide clearances for servicing and removal of mechanical equipment.

G. Use galvanized piping for ball drip discharges, drains subject to alternate wetting and drying, and water motor piping. Use galvanized fittings for all piping systems where galvanized piping is required.

H. Threads on fittings and bolts shall be fully engaged. At least two threads shall be visible through the nuts of all bolted connections. Threads shall be made up using approved joint compound or tape.

I. No sprinkler shall be located closer than 6" from an adjacent wall.

J. Sprinklers shall be visibly aligned on the ceiling and centered in the tiles. Sprinkler escutcheon plates shall be set tight against the ceiling.

K. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

L. All drains shall be piped to spill over the nearest floor drain or as noted on the plans. Exterior drain piping shall exit the building no higher than 12 inches above finished dirt grade, or 6 inches above finished concrete. All exterior drain pipe and associated fittings shall be galvanized.

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than 1/4" NPS and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

N. Drain dry-pipe sprinkler piping.

O. Torch cutting is not permitted as a means of modifying sprinkler or standpipe systems.

P. Automatic air vent shall be located off the top of horizontal piping at high point of the system.

Q. Install grooved joint fittings and valves per manufacturer's recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

R. FDC Plugs: submit FDC registration form to plug manufacturer (Knox Company) and ensure key wrenches are delivered to local fire department.

3.03 HANGERS AND RODS

A. Hanger rod orientation: Piping hanger rods shall be installed perpendicular to the pipe it supports. *Exception: rods suspended from sloped ceilings/roofs shall be oriented to support the vertical load.*

B. Threaded rods may be bent to facilitate correct support orientation provided the rod is bent as close to the upper hanger component as possible. Rod bending is permitted only in a non-threaded section. When entire rod is threaded, a swivel assembly shall be used to achieve proper component orientation.

3.04 DRY SPRINKLERS

A. Provide dry pendant sprinklers at all locations subject to freezing (e.g. vestibules, cold storage coolers, exterior stairwells, etc.). Where dry sprinklers are not possible, use an auxiliary piping system.

B. Provide dry horizontal sidewall sprinklers in rooms dedicated to electrical equipment (i.e. Electrical Rooms, IT Rooms/Server Rooms (less than 260 sqft), Hub Closets, etc.). Sprinkler piping, wet or dry, through/over these areas is prohibited. Dry horizontal sidewall sprinkler(s) shall be connected to wet pipe system serving adjacent space. Order length shall be no less than 8".

3.05 AIR COMPRESSORS

A. Shall be installed in accordance with NFPA 70, Article 430.

B. Disconnect Switch:

1. Shall be connected to a listed motor-circuit switch (industrial duty disconnect switch) rated for horsepower.
2. Disconnecting means *shall not* be general-use light switch or a cord-and-plug connected motor.
3. Disconnect or breaker handle shall have padlocking provisions.

C. Mount air compressors on 4” high reinforced concrete pads. Pipe drains from compressor and drier to floor drain.

D. Size compressors per NFPA 13 based on piping system size.

3.06 TESTS AND INSPECTIONS

A. All tests and inspections of the system and its components shall be conducted as per NFPA 13 and witnessed by representatives of the Architect, the engineer, the installer, the local fire department (at their discretion), and the Insurance and Regulatory Agencies at a time coordinated between all parties. A minimum of five days notice shall be given than the system is ready for tests. *Note: The General Contractor may act as a representative witness for the project engineer to ensure underground pipe and water entry locations are installed as specified.*

B. Wet Pipe Systems: Each portion of the interior piping shall be hydrostatically tested for two hours at 200 psig measured at the bottom of the system. All leaks shall be repaired until the system is tight for two hours.

C. Dry Pipe Systems: Each portion of the interior piping shall be pneumatically tested at 40 psi for a period of 24 hours. Leaks shall not exceed 1.5 psi over said period, otherwise system shall be repaired and tested again until it is tight for the entire 24-hour period.

D. Final inspection shall include operation of all water flow detection devices, alarm valves, and drains.

E. The Contractor shall submit a report recording test results, switch settings, and witnesses. Material and Test Certificates, as indicated in NFPA 13, shall be completed and submitted for all piping systems.

3.07 IDENTIFICATION SIGNS AND RECORD PLANS

A. GENERAL INFORMATION SIGN: The installing contractor shall provide a general information sign per **NFPA 13: 28.6**. (ref **NFPA 13: *Figure A.28.6***)

B. SPRINKLER LIST: A list of installed sprinklers shall be posted in the sprinkler cabinet. (Per **NFPA 13: 16.2.7.7.1**)

C. Per **NFPA 13: 16.9.12.1** all sprinkler valves shall be provided with permanently marked weather-proof metal or rigid plastic identification sign. All sprinkler zone control valves shall be clearly tagged with a 6" x 2" rust-free, customized aluminum sign indicating which areas of the building they serve (i.e. "1st FLOOR", "SHOP", "RETAIL", ect.) In addition, all auxiliary drain and inspectors test valves shall have a 6" x 2" red sign with white letters "AUXILIARY DRAIN" or "INSPECTORS TEST". Acceptable manufacturers: ARGO, FPPI, Seton Identification Products, Emedco, Tyco Type B, Brooks Equipment, SafetySign, or approved equal.

D. ON-SITE RECORD PLANS: One clean copy of all sprinkler working plans shall be sealed in a plastic envelope and attached to the wall near sprinkler riser.

E. Installer shall permanently mount signage indicating system hydraulic design and water supply demands.

1. HYDRAULIC DATA NAMEPLATE: Attach engraved aluminum placard/nameplate, or plastic placard, or vinyl with adhesive back (inked with permanent marker) to the base of each sprinkler riser with design flow and pressure for the system. Acceptable manufacturers:

    a. ARGO Item #50-10-240 or Item #50-20-240
    b. Seton Identification Products Style No. 91246 or Style No. 98139
    c. Emedco Part No. SHS300
    d. Brooks Equipment Part No. A232
    e. Tyco Type E
    f. Fire Sprinkler Products and Accessories (FPPI) item 02-077-00
    g. SafetySign (SPR-CUST-16-FA)
    h. or approved equal.

END OF SECTION 21 00 00

SECTION 21 00 10
GENERAL PROVISIONS – FIRE SUPPRESSION

PART 1 – GENERAL

1.01 DESCRIPTION

A. These Mechanical General provisions specified herein apply to all Sections of Division 21.

1.02 WORK INCLUDED

A. Provide all materials, labor and services as specified in Division 21 and shown on the accompanying drawings.

1.03 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the General Conditions, and are applicable to all Fire Suppression Sections.

1. Provide: Furnish, install and connect completely.
2. Piping: Pipe installed with all required fittings, valves and accessories, and forming a complete system.
3. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, and accessories completely installed.
4. Power Wiring: Wiring which supplies the electrical current which flows through a connected motor or heater.
5. Exposed: Revealed to view or subject to weather.
6. Control, interlock and starting circuit wiring: All wiring required by all Mechanical Sections that is not power wiring.
7. Fittings: All connecting pieces of a system.

B. Drawings: The Mechanical Drawings are diagrammatic except where specifically indicated otherwise. Refer to Architectural and Structural Drawings for building dimensions.

C. Materials: Refer to the General Conditions. All material shall be suitable for the service and operating conditions of this Specification.

1.04 ABBREVIATIONS

A. The following abbreviations are used in this Division of the Specifications:

ASTM	American Society for Testing Materials.
ASME	American Society of Mechanical Engineers.
NFPA	National Fire Protection Association.
ANSI	American National Standards Institute.
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
AWWA	American Water Works Association.

1.05 APPLICABLE CODES

A. All work shall be in strict accordance with Clayton County Requirements, including the latest Georgia State Fire Commissioner's Rules and Regulations, and the latest adopted Georgia Department of Community Affairs Mandatory Codes.

1. International Building Code, 2018 Edition, with Georgia Amendments (2020).
2. International Fire Code, 2018 Edition, with Georgia Amendments (2020).
3. National Electrical Code, 2020 Edition, with Georgia Amendments (2021).
4. All City, County, State, Regional, and other ordinances applicable to the work shall apply.

1.06 RELATED WORK

A. The following work is generally specified in other Divisions of the Specifications, except as specifically otherwise stated in this Division.

1. Electric power wiring.
2. Painting.
3. Installation of access panels in walls and ceiling construction.
4. Installation of starters, contactors, thermal overload switches, and remote push buttons.
5. Curbs, other than pre-fabricated.
6. Furnishing and installation of motor control center.
7. Cutting and patching of walls, floors, ceilings, roofs, and structure of existing buildings.
8. Demolition.
9. Excavation.
10. Trenching and backfilling.

1.07 SPACE CONDITIONS

A. All work shall fit the spaces available. Verify all dimensions of the work before commencing fabrication and/or installation.

B. Minor deviations from the drawings required to conform to space conditions and to provide the required operation, service, or maintenance accessibility shall be made at no additional cost, and subject to approval.

C. Piping or equipment shall not be installed in electrical equipment rooms. Outside of electrical equipment rooms, do not run piping or ductwork, or locate equipment, with respect to switchboards, panel boards, power panels, motor control centers, or dry type transformers:

Within 42" in front (and rear if free standing) of equipment; or
Within 36" of sides of equipment
Clearances apply vertically from floor to ceiling structures.

D. Hydronic piping shall not be installed above any electrical or control panels.

1.08 RECORD DRAWINGS

A. Upon completion of the Project, the Contractor shall submit one set of contract prints with red marks indicating As-built conditions of all piping, ductwork, and equipment, and incorporating changes made during construction. A record of as-built conditions shall be kept throughout the Project and shall be used in the preparation of the final record drawings.

B. The Contractor shall provide digital images (minimum resolution of 1152 x 864 pixels in JPEG standard image file format) delivered via email or on CD, of any utilities/piping that are installed underground with a reference drawing indicating which direction each picture is taken. The reference drawing shall dimension the utility/piping from a prominent fixed object.

1.09 GUARANTEES

A. Furnish a written guarantee covering each category of work for a period of one year from date of legal acceptance for the project. Guarantee shall include prompt correction of all leaks.

B. Guarantee shall be furnished in exact conformity with the requirements of the General Conditions.

1.10 BUILDING UTILITIES

A. Arrange with appropriate utility agencies for the connection of all utility services and pay all charges in connection therewith.

B. Fire water service shall connect into the street main.

C. Where boring under city streets or state highways is required for connection to utilities, contractor shall confirm and follow requirements as outlined by authority responsible for utility systems. All costs for boring shall be paid by the contractor.

1.11 CONTINUITY OF SERVICE

A. All work shall be scheduled with that of other trades. The following conditions shall apply to all affected work.

B. Before disconnecting any existing systems for changes, the Contractor shall:

1. Have all materials needed stored at the job site.
2. Have assurance that all labor and skilled mechanics needed will be available at the proper time.
3. Estimate the time the system will be out of service and inform the Owner in writing.
4. Secure approval of the shutdown dates from the Owner in writing before disconnecting the system.

C. Work shall be so conducted that the water supply and drainage of existing services will not be interrupted when such services are required for normal usage of the occupied portions of the existing building.

D. Work shall be done at such time and in such manner as to cause minimum inconvenience to the Owner and as approved by him or his representative. No allowance will be made for lack of knowledge of existing conditions.

1.12 EXISTING CONDITIONS

1.13 OPERATING INSTRUCTIONS

A. Instructions: Instruct the Owner's representative in operation of the installed systems. The basis of these instructions shall be those written for inclusion in the maintenance and operating instruction data specified herein. Obtain certificates, signed by the Owner's representative, that these instructions have been received.

B. Notification: Notify the Owner at least five days before commencing operating period for refrigeration and heating equipment, as specified herein, in order that the Owner's representative may be present during that period.

1.14 DOCUMENTATION

A. Documents to be submitted prior to request for final inspection:

1. Maintenance Manuals per Section 21 01 00 Operation and Maintenance of Fire Suppression.
2. Three copies of multi-year warranties bound in a brochure with index listing equipment.

B. Data to be Delivered at Final Inspection:

1. Record Drawings.
2. Certificate by Owner's representative confirming that operating instructions have been received.

1.15 SUBMITTALS

A. Procedure: Refer to the GENERAL CONDITIONS and SUPPLEMENTS thereto for submittal procedure of items called for in the Contract Documents.

B. Submittal data covering the work of this Division will be reviewed only after such items have been reviewed in detail and approved by the Contractor, such approval being indicated by suitable notations or stamp on the data.

C. Each submittal shall be clearly marked indicating Section and paragraph for which it is intended. Any deviations, exclusions or substitutions from specified material requirements shall be specifically identified in a summary sheet at the front of the submittal.

D. Where submittal sheets contain multiple products or selections, the specific item being submitted for review shall be clearly indicated with a red arrow (stamped or hand written). “Catalog” submittals (multiple items contained in the submittal, specific items not identified) will be rejected and not reviewed.

E. Submit the requested submittals in sufficient quantity to provide two copies in addition to those required by Contractor.

F. All pump submittals shall include performance curves indicating flow, pressure, efficiency, and power requirements. For pumps, adjacent impeller selections shall be included.

G. Motor Tabulation on all motors furnished listing the following nameplate data: Horsepower, voltage, phase and full load amps.

H. Submittal List: See the individual Mechanical Specification Sections for specific submittal requirements.

1.16 SHOP DRAWINGS GENERAL:

A. Shop drawings and calculations shall be meet NFPA 13 Chapter 27 *Plans and Calculations* requirements.

END OF SECTION 21 00 10

SECTION 21 01 00
OPERATION AND MAINTENANCE OF FIRE SUPPRESSION

PART 1 – GENERAL

1.01 MAINTENANCE AND OPERATING MANUALS

A. Provide manual in number of copies indicated under Section 21 00 10 General Provisions - Fire Suppression.

B. Material submitted in the manuals shall represent the equipment manufacturer, model, and type installed on the project.

PART 2 – PRODUCTS

2.01 MAINTENANCE AND OPERATING MANUALS

A. Maintenance and Operating Manuals shall consist of the following as a minimum:

1. Hardback three ring binders with job name and Owner's name on cover.
2. Typed index listing name, address, and phone number of the General Contractor, Fire Protection Subcontractor, Controls Subcontractor, and all major equipment suppliers.
3. Typed table of contents, listing each Section, title, and number.
4. All Sections shall be tabbed with plastic tabs listing Section numbers.
5. Each item of equipment requiring maintenance and operation data as noted in each specification section shall be provided with an index listing the types of equipment installed. Submittal data shall be included to the extent necessary to identify equipment, including summary sheet, such as model, size, air or water flow, pressure developed, speed, and motor size. Instructions shall include type and suggested frequency of maintenance, oiling, cleaning, disassembly, and reassembly directions, and wiring diagrams.
6. One section shall include a complete set of record control drawings, bound in a plastic insert, full size, complete with a written sequence of operation for all control systems.
7. Letters, where factory startup or checking has been required, certifying completion of performance.

PART 3 – EXECUTION

3.01 MAINTENANCE AND OPERATING MANUALS

A. All maintenance and operating manuals shall be complete and ready to turn over to Owner's representative at final inspection.

B. Incomplete manuals will be returned to the Contractor for complete resubmission. Loose leaf submittal of material at various stages of completion will not be acceptable.

END OF SECTION 21 01 00

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section of specifications deals with materials and methods pertaining to all work specified under Division 21.

1.02 RELATED SECTION

A. Section 21 00 10 General Provisions Fire Suppression

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide submittal data showing starter dimensions, weight, electrical requirements, and service access requirements.

C. Provide submittal data showing firestop systems, including details for penetrations and instructions for installation

D. Provide manufacturer's instructions, indicate installation and support requirements.

1.04 JOB CONDITIONS

A. Install all apparatus so as to maintain maximum headroom and clearances consistent with requirements of the drawings and specifications.

B. All equipment requiring service shall be installed to permit access for servicing without damage to building structure or finishes.

PART 2 – PRODUCTS

2.01 STRUCTURAL ATTACHMENTS

A. Structural attachments for sprinkler systems shall be in accordance with NFPA13.

2.02 ACCESS PANELS

A. Access panels shall be flush concealed hinge and latch type complete with frame. Panels shall be minimum 18" x 18", selected for the specific type of ceiling or wall where installed. Locks shall be flush screw turn type.

B. Panels shall be primed for finish painting in ceilings or walls to be painted.

C. Panels installed in rated walls or ceilings shall be UL listed for the same rating as the wall in which they are to be installed, except 1½ hour panels are acceptable in two (2) hour walls.

2.03 FIRESTOP SEALANT

A. Firestop sealant shall be a synthetic elastomer caulk, strip, or sheet designed for use as a one part fire, smoke, and gas sealant. Material shall be intumescent and capable of being installed with caulk gun, shears, and putty knife. Material shall be UL classified and Factory Mutual approved for sealing in floors, walls, or partitions to 2 hour rating per ASTM E 119.

B. Fire barrier material shall be 3M Fire Barrier, Hilti FS-ONE, Specified Technologies Inc. (STI) SpecSeal Sheet, Strip, and Caulk.

2.04 ASBESTOS

A. All materials used in this work shall be asbestos free.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All work shall be installed plumb and square unless clearly indicated otherwise. Installation shall be performed by competent persons, trained in their respective skills.

B. Furnish and install equipment complete, including connections, services and adjustments for systems to operate safely and in compliance with requirements of the contract.

C. Install each item in full compliance with current recommendations of the manufacturer. Equipment manufacturer or his authorized representative shall furnish services and/or supervision necessary to ensure compliance with this provision. Conflict between manufacturer's recommendation and other contract requirements shall be resolved before installation.

D. Requirements of the several acceptable manufacturers for each specified item of equipment may vary as to installation details, location and number of connections, dimensions and weight. Provide all drawings, services, material, and labor necessary for the installation and proper functioning of the equipment furnished.

3.02 PROTECTION OF MATERIALS AND EQUIPMENT

A. Take precautions to protect all materials and equipment from damage during the construction process.

B. Do not store materials and equipment outdoors subject to weather without complete weather protection.

C. Do not install materials or equipment in a partially constructed structure exposed to weather, unless all material and equipment is continuously protected from damage by weather or the construction process.

D. Material and equipment damaged by improper protection during construction is subject to replacement based on the judgment of the Engineer at no cost to the Owner.

3.03 CUTTING AND REPAIRING

A. Cut and repair all walls, floors, and ceilings necessary for the installation of the mechanical work, but no cutting of work of other trades will be permitted without the consent of the Architect or his representative.

B. All cutting and repairing of walls, floors, and ceilings shall be subject to the supervision and approval of the Contractor.

3.04 CLEANING AND FINAL CLEAN-UP

A. Keep the premises free of waste, debris and surplus materials.

B. After equipment has been installed, remove all extraneous materials, rust and stains; blow, vacuum or flush all foreign matter from all equipment.

C. Identification plates on equipment shall be free of paint and shall be polished.

3.05 EXCAVATION AND BACKFILL

A. Do all trenching, excavating and backfilling required for the Mechanical Sections. Include all necessary repairing, shoring, bracing, pumping and protection for safety of persons and property. Repairing shall be comparable to work cut and shall be approved by the proper authorities.

B. Slope sides of excavations to comply with OSHA regulations and local ordinances having jurisdiction. Shore and brace where sloping is not possible either because space restrictions or stability of materials excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. Care shall be taken to avoid existing facilities in excavating. Contractor shall be responsible for all damage to existing facilities in executing this work.

D. Excavate rock to depth of 6" below bottom of pipe. Space between rock and pipe shall be filled with sand.

E. Bottom of trenches shall be graded to secure the required fall. Size of bell holes for soil and sewer pipe shall be held to a minimum so that the entire pipe length rests on compacted fill or undisturbed earth.

F. Backfill shall be placed completely under pipe haunches and in bell holes and uniformly tamped in 6" layers. Backfill over top of pipe with select materials free of clods, stones, boulders, and foreign materials. Back fill shall not be installed until pipe is insulated, tested and field inspected by inspector.

G. Backfill shall be compacted to 95% of maximum dry density as determined by a Standard Proctor Test, ASTM-D698, except where under areas to be paved, top 12 to 24 inches of fill shall be compacted to 97% dry density by above standard.

3.06 PIPING SUPPORTS AND ANCHORS

A. Sprinkler piping shall be supported and anchored as required by NFPA 13.

3.07 HANGER SIZES

A. Hangers shall be sized to fit the pipe.

3.08 STRUCTURAL ATTACHMENTS

A. Inserts shall be used for individual loads exceeding 150 lbs. Concrete fasteners may be used where approved in writing by Architect for individual loads of 150 lbs. or less.

B. Inserts shall be secured to the forms before the pouring of concrete. In all spaces with exposed concrete ceilings, the openings not filled with rods and nut shall be filled with cement grout flush with the ceiling.

C. Shooting of fasteners into the slab shall be allowed only in approved locations.

D. Devices for connection to the structure shall not be loaded more than 75% of the manufacturer's rated load.

3.09 ACCESS PANELS

A. Access panels shall be installed at all points where equipment, devices or apparatus requiring adjustment, maintenance or servicing cannot be readily accessed through the ceiling or wall.

B. Accessible ceilings are defined as lay-in frame type and access panels are not required for equipment or apparatus above these ceilings.

C. Panels shall be located so that apparatus or equipment can be reached by an arm's length.

3.10 FIRESTOP SEALING FLOOR AND WALL PENETRATIONS

A. Where ductwork, piping, control tubing, and conduit penetrate fire or smoke rated walls and floors, the penetration shall be sealed with fire barrier herein specified.

B. Fire barrier shall be installed in strict accordance with manufacturer's printed instructions. Material shall be installed with sufficient depth to maintain a fire endurance rating equivalent to that of the adjacent wall or floor.

END OF SECTION 21 05 00

SECTION 21 05 53
IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the identification requirements for the mechanical systems.

1.02 RELATED SECTIONS

A. Section 21 00 00 General Provisions Fire Suppression

B. Section 21 05 00 Common Work Results for Fire Suppression

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

C. Schedules: Submit valve schedule for each piping system, typewritten and produced on 8½" x 11" bond paper. Include valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and any variations for identification. If addition to framed copies, furnish extra copies for maintenance manuals as specified in Division 1.

1.04 SUMMARY

A. Section includes:

1. Plastic Coiled Pipe Markers.
2. Pressure Sensitive Adhesive Pipe Markers.
3. Underground Warning Tape.
4. Valve Tags and Schedules.
5. Engraved Plastic Signs.
6. Engraved Equipment Markers.
7. Plastic Tags.

1.05 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A13.1 - 2015 Edition, *Scheme for the Identification of Piping Systems*.

B. Department of Labor 29 CFR 1910.1200.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification products of types and sizes required, whose products have been in satisfactory use for a period of five (5) years.

B. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification products.

PART 2 – PRODUCTS

2.01 IDENTIFICATION MATERIALS

A. Provide manufacturer's standard products for each application as referenced in this section.

2.02 PIPE MARKERS

A. Pressure-Sensitive Type: Provide manufacturer's standard preprinted, permanent adhesive, color-coded pressure sensitive vinyl labels complying with ANSI A13.1. Color-coded plastic adhesive flow directional arrow tape, full circle at both ends of the pipe marker, tape overlapped 1-1/2". Use 1" tape for piping less than 2-1/2", 2" tape for 2-1/2" thru 8" piping; and 4" tape for larger piping.

B. Lettering: Comply with ANSI A 13.1 for piping system nomenclature. Abbreviate only as necessary to accommodate marker length.

2.03 UNDERGROUND TYPE PLASTIC LINE MARKERS

A. Metallic Piping: Provide manufacturer's standard non-detectable permanent, continuous printed plastic tape, intended for direct burial service, not less than 3" wide by 4 mils thick. Provide tape with printing most accurately indicating type of service of buried pipe.

2.04 VALVE TAGS

A. Tags: provide permanently marked weatherproof metal or rigid plastic identification signs.

B. Control Valve Tags: baked porcelain enameled steel (low carbon steel)

C. Valve Tag Fasteners: Use corrosion-resistant wire or chain with "S" hooks to secure valve tags.

D. Chart Frames: Provide one (1) aluminum 8 ½" x 11" valve chart frame with glass lens for each valve schedule provided.

E. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic access panel markers with abbreviations and numbers corresponding to the concealed valve.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Where identification is to be applied to surfaces requiring painting, insulation, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. The installer shall permanently and clearly label all valves and fire protection piping (i.e. standpipe distribution piping), that its purpose is not obvious. Identification for control valves shall identify the area which is controlled. Contractor shall label all drains for their purpose and label the location of drain outlet at the test valve for ease of test and maintenance.

3.02 MARKER LOCATION

A. Piping Identification: Fire Suppression Piping tape background color shall be red with white lettering reading “FIRE PROTECTION WATER”.

B. Locate pipe markers and/or color bands (if required) wherever piping is exposed to view, and at least one marking per room above suspended ceilings. Per the following:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units mark each branch where there might be a question of flow direction.
3. Near locations where pipes pass through walls, floors, or ceilings or where they enter non-accessible locations.
4. Behind removable panels and other access points permitting view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. On piping above removable acoustical ceilings.
7. At maximum intervals of 40’ along each straight pipe run, except to 25’ in congested areas.

3.03 UNDERGROUND PIPE IDENTIFICATION

A. During backfilling of each exterior underground piping system, install continuous underground plastic line markers directly over buried line at 6” to 8” below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16” install a single line marker.

3.04 VALVE IDENTIFICATION

A. Provide a valve tag on every control device in each piping system. Exclude check valves, valves within factory fabricated equipment units. List each tagged valve in a valve schedule for each piping system.

3.05 EQUIPMENT IDENTIFICATION

A. Install engraved plastic signs or equipment markers on or near each major item of mechanical equipment and each operational device, per the equipment schedule. Attached tag to the ceiling grid directly under equipment installed above lay-in ceilings. Provide markers for the following general categories of equipment and operational devices.

1. Main control and operating valves including safety devices and hazardous units.
2. Meters, gauges, and similar units.
3. Zone valves.
4. Inspector's Test valves.
5. Drain valves.

B. Method of installation: Use stainless steel screws except where adhesive is necessary because substrate cannot or should not be penetrated. Use rivets for tags attached to the ceiling grid.

END OF SECTION 21 05 53

SECTION 21 10 00
PIPE, FITTINGS AND ACCESSORIES – FIRE SUPPRESSION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Piping specified in this Section is for types of pipe and accessories used in Division 21.

1.02 RELATED SECTION

A. Section 21 05 00 Common Work Results for Fire Suppression.

1.03 QUALITY ASSURANCE

A. Codes and regulations referred to are minimum standards. Where the requirements of these specifications or drawings exceed those of the codes and regulations, the drawings and specifications govern.

B. Pressure/temperature ratings of all components and accessories shall meet or exceed design conditions for the system in which they are installed.

C. Welding shall be in accordance with procedures of the National Certified Pipe Welding Bureau and shall comply with the requirements of the ANSI Code for Pressure Piping. Welders shall be qualified under the above procedures and certified by the National Certified Pipe Welding Bureau.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

A. Steel Piping:

1. Normally wet pipe smaller than 1-1/4" and ALL normally-dry pipe:

Material	Specification
Schedule 40 Black steel	ASTM A135 Grade B

2. Pipe (1-1/4" up to 12” diameter):

Material	Specification
Schedule 10 Black steel	ASTM A53-97b Grade B
Schedule 80 Black steel	ASTM A106-99
Schedule 40 Galvanized steel	ASTM A53-97b

3. Fittings:

a. 150 lb. SWP malleable iron screwed fittings conforming to ANSI B16.3.
b. 125 lb. SWP cast iron flange fittings conforming to ANSI B16.1.
c. Standard weight factory fabricated butt welding fittings conforming to ANSI B16.9 and ASTM A-234.
d. 150 lb. forged steel welding neck or flat face slip-on flanges conforming to ASTM A181.
e. Socket fittings conforming to ANSI B16.11.

f. Cast iron drainage pattern fittings conforming to ANSI B16.12.
g. Dielectric couplings and/or flange kits shall be provided at connections between ferrous and non-ferrous pipe.
h. Unions:

1) Except where otherwise specified, unions in welded piping shall be flanges.
2) Unions in piping 2-inch and smaller shall be 150 lb. malleable iron, ground joint, bronze to iron, screw type.
3) Unions in screwed piping 2½" and larger shall be 125 lb. cast iron flanges.

i. Fittings, flanges and unions in galvanized steel pipe shall be galvanized.

4. Joints, unless specified otherwise:

a. Screwed Joints: Joint compound shall be "Tite-Seal" or Teflon tape, except where otherwise specified.
b. Welded Joints: Welding rods shall be compatible with the material to be welded. Welding shall be by electric arc or oxyacetylene methods.
c. Flanged joints shall be made up with 1/16" thick, ring type, compressed composition sheet gasket, except for gas piping which shall be made up with aluminum "O" ring type gaskets. Flange bolts shall be steel hexagon head type, conforming to ASTM Specification A-307. Nuts shall conform to ASTM Specification A-193.

B. Ductile Iron Pipe:

1. Pipe: AWWA C151, with bituminous outer coating, Class 51 for 4” size and under; Class 50 for 6” and larger. Drainage pipe and fittings to have bituminous inner coating and water service pipe to have cement lining.
2. Fittings: 250 lb. rated ductile iron with mechanical joints and bituminous outer coating, AWWA C110 for water. Service weight coated pipe for soil or rain water piping.

C. Victaulic Pipe

1. Steel Pipe (up to 12” diameter):

Material	Specification
Schedule 40 Black steel	ASTM A53-97b Grade B

2. Steel Pipe (12” and larger diameter):

Material	Specification
Standard weight Black steel	ASTM A53-97b Grade B

3. Steel Fittings:

a. Ductile iron fittings, conforming to ASTM A-536; forged steel, conforming to ASTM A-234; or fabricated from carbon steel pipe, conforming to ASTM A-53 with grooved ends in accordance with AWWA C606.
b. Couplings for use with grooved end fittings shall consist of ductile iron housings, conforming to ASTM A-536, complete with pressure responsive synthetic rubber gasket. (Grade to suit the intended service.)

1) Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9.

2) Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings shall be placed in close proximity to the vibration source.
3) Dielectric waterways shall be provided at connections between ferrous and non-ferrous pipe. Dielectric waterways shall consist of ductile iron or carbon steel body, zinc electroplated, with LTHS high temperature stabilized polyolefin polymer liner.
4) Where grooved joint piping systems are utilized, unions are not required. Couplings shall serve as unions.

2.02 SLEEVES

A. Provide standard weight steel pipe sleeves at all points where piping passes through walls, floors and ceilings, except where otherwise specified.

B. #20 U.S. gauge galvanized steel sleeves may be used through all walls and through floors in concealed pipe chases where concrete thickness is 4" or less.

PART 3 – EXECUTION

3.01 PIPING - GENERAL

A. All piping shall be run straight and parallel to building construction. All changes in directions shall be made with fittings as specified herein and shown on the drawings.

B. All piping shall be installed with allowance for expansion and contraction. Anchors and guides shall be provided where shown on the drawings. Swing joints shall be provided at top and bottom and risers and in branch connection at each floor.

C. Pipe connections to equipment which is supported independent of the pipe, including pumps, shall be aligned with the equipment.

D. Buried piping outside the building shall be buried a minimum of 24-inches deep.

E. Install piping so as to preserve access to all valves, air vents, and other equipment and to provide the maximum headroom possible.

F. All piping, except cast iron, which runs through concrete slabs or walls shall be insulated or caulked in sleeves as hereinafter specified so that the pipe metal does not come in contact with the concrete masonry.

G. Unions shall be provided at all connections to flow control valves, equipment and apparatus.

3.02 PROCEDURES FOR PIPE JOINTS

A. Welded Joints:

1. All welding of pipe shall conform to the ASME and ANSI Standards B31.1 Power Piping and B31.9 Building Services Piping.

2. Mitering or notching pipe to form elbows and tees will not be permitted. Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of slag, scale and oxidation prior to welding.
3. Before welding, the component parts to be welded shall be aligned so no strain is placed on the weld when finally positioned. Height shall be aligned so that no part of the pipe wall is offset by more than 20 percent of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operations. Connections larger than 6" shall be made with backing rings at welds.
4. Where the temperature of the component parts being welded reaches 32°F or lower, the material shall be heated to approximately 100°F for a distance of 3' on each side of the weld before welding, and the weld shall be finished before the material cools to 32°F. All welds shall be full penetration welds.
5. Defective welds shall be removed and replaced at no additional cost to the Owner. Repairing of defective welds by adding new materials over the defects or by peening will not be permitted.
6. Electrodes shall be stored in a dry, heated area and shall be kept free of moisture or dampness during fabrication operations. Electrodes that have lost part of their flux shall be discarded.
7. Fire protection safeguards shall be employed in connection with welding operations.
8. No welding will be permitted where communication equipment has been installed.
9. Before any welder shall perform any pipe welding, submit a copy of the Welding Operator Qualification Test as required by the referenced standards cited hereinbefore.

B. Screwed Joints:

1. All threads shall be standard, clean cut and tapered. All burrs shall be reamed from inside of the pipe and pipe shall be turned on end and all loose dirt and scale knocked out.
2. Pipes with threads stripped, chipped or damaged, or split pipe or defective fittings shall not be used.
3. Joint compound shall be applied to the male threads only.

C. Flanged Joints: Gaskets shall extend to inside the bolt holes, and flanges shall be brought up truly and water and air tight on gaskets by tightening bolts on opposite sides of the pipe.

D. Ductile Iron Pipe Joints:

1. Compression joints shall consist of one piece elastomer gasket conforming to ASTM C-564.
2. Hubless and Gasketed Joints shall be made up in strict accordance with manufacturer's recommendations.

E. Victaulic Joints:

1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
2. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
3. Assemble piping system per manufacturer’s recommendations.
4. Cut grooves are not acceptable, unless otherwise specified (i.e. for dry pipe system).

3.03 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

1. Sleeves through outside walls above grade shall be caulked watertight between pipe or pipe insulation and sleeve with lead and oakum.

2. Pipes penetrating walls below grade shall be sealed with a waterproof, modular, mechanical expansion seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Sizing of links and wall sleeve shall be determined by manufacturer. GPT "Link-Seal" or Metraflex “MetraSeal”.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. SLEEVE-SEAL SYSTEMS

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Advance Products & Systems, Inc.
   b. CALPICO, Inc.
   c. Metraflex Company (The).
   d. Pipeline Seal and Insulator, Inc.
   e. Proco Products, Inc.

2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

   a. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   b. Pressure Plates: Carbon steel.
   c. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

G. GROUT

1. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Characteristics: Nonshrink; recommended for interior and exterior applications.
3. Design Mix: 5000-psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

H. SLEEVE INSTALLATION

1. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

   a. Exceptions:

      1) Sleeves are not required in gypsum board partitions/walls.
      2) Omit sleeves where fire protection pipes pass through masonry partitions and slabs, provided ALL of the following conditions are met:

         a) cored holes (no jagged edges)
         b) a pipe hanger or support within 24” of penetration

c) pipe is centered in the cored hole

2. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

   a. Sleeves are not required for core-drilled holes.

3. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

   a. Cut sleeves to length for mounting flush with both surfaces.

      1) Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

   b. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

4. Install sleeves for pipes passing through interior partitions.

   a. Cut sleeves to length for mounting flush with both surfaces.
   b. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   c. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 21 05 00 " Common Work Results for Fire Suppression".

5. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 21 05 00 "Firestop Sealant."
6. Sleeves through poured concrete shall be secured to the forms before concrete is poured.
7. Sleeves shall be spaced sufficient distance from adjacent walls and other sleeves so that insulation and/or finish plates may be installed without cutting insulation or plates.
8. Sleeves shall be placed on the piping as it is installed to permit installation of sleeves in walls, partitions, and slabs in one piece.

3.04 PRESSURE TESTING

A. See particular piping section for pressure testing requirements.

END OF SECTION 21 10 00

SECTION 22 00 10
GENERAL PROVISIONS – PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION

A. These Mechanical General provisions specified herein apply to all Sections of Division 22.

1.02 WORK INCLUDED

A. Provide all materials, labor and services as specified in Division 22 and shown the Drawings.

1.03 DEFINITIONS

A. Terms: The following definitions of terms are applicable to all Mechanical Sections.

1. Provide: Furnish, install and connect completely.
2. Piping: Pipe installed with all required fittings, valves and accessories, and forming a complete system.
3. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, and accessories completely installed.
4. Power Wiring: Wiring which supplies the electrical current which flows through a connected motor or heater.
5. Exposed: Revealed to view or subject to weather.
6. Control, interlock and starting circuit wiring: All wiring required by all Mechanical Sections which is not power wiring.
7. Fittings: All connecting pieces of a system.

B. Drawings: The Mechanical Drawings are diagrammatic except where specifically indicated otherwise. Refer to Architectural and Structural Drawings for building dimensions.

C. Materials: All material shall be suitable for the service and operating conditions of this Specification.

1.04 ABBREVIATIONS

A. The following abbreviations are used in this Division of the Specifications:

AGA	American Gas Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitation Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual
LEED	Leadership in Energy and Environmental Design
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
NEMA	National Electrical Manufacturers Association

NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PDI	Plumbing and Drainage Institute
SCS	Soil Conservation Service
UL	Underwriters Laboratories, Inc.
USGBC	United States Green Building Council

1.05 APPLICABLE CODES

A. The latest amended editions of the codes applicable to the work of the municipality having jurisdiction.

B. In the absence of any municipal adopted codes, the following shall apply:

1. International Building Code, 2018 Edition, with Georgia Amendments.
2. International Fire Code, 2018 Edition.
3. International Plumbing Code, 2018 Edition, with Georgia Amendments.
4. International Mechanical Code, 2018 Edition, with Georgia Amendments.
5. International Fuel Gas Code, 2018 Edition, with Georgia Amendments.
6. ASHRAE 90.1-2013 Energy Standard for Buildings Except Low-Rise Residential Buildings
7. Chapter 120-3-20: Georgia Accessibility Code for Buildings and Facilities.
8. Chapter 120-3-3: Georgia Rules and Regulations for the State Minimum Fire Safety Standards.
9. All City, County, State, Regional, and other ordinances applicable to the work shall apply.

1.06 QUALITY ASSURANCE

A. This work requires special construction expertise that must be verified through documented experience. Therefore, any major Sub-Contractor submitting a bid for this scope of work must confirm that he has completed similar work. The following requirements for Work Experience and Contracting Experience and Licensing shall be documented and submitted with other required forms.

1. Demonstrated experience in completing installations of at least three (3) similar projects and a minimum of five (5) years experience involving renovation, additions and new work of domestic water, sanitary, waste and vent piping systems and natural gas piping systems.
2. Contracting Experience and Licensing:

    a. The Contractor shall have been in business under the present company name for a minimum of five (5) years, shall have a State of Georgia, Master Plumber Class II license. An officer, partner or principal of the Contractor shall be the holder of the License.
    b. The Contractor shall not have been declared in default on any construction contract within that time.

B. Experience outlined in paragraphs above must be demonstrated by projects which are complete prior to the bid date for this work.

1.07 SPACE CONDITIONS

A. All work shall fit the spaces available. Verify all dimensions of the work before commencing fabrication and/or installation.

B. Minor deviations from the Drawings required to conform to space conditions and to provide the required operation, service, or maintenance accessibility shall be made at no additional cost, and subject to approval.

C. Piping and equipment shall not be installed in electrical equipment rooms. Outside of electrical equipment rooms, do not run piping or locate equipment, with respect to switchboards, panel boards, power panels, motor control centers or dry type transformers:

Within 42" in front (and rear if free standing) of equipment; or
Within 36" of sides of equipment
Clearances apply vertically from floor to ceiling structures.

D. Hydronic piping shall not be installed above any electrical or control panels.

1.08 RECORD DRAWINGS

A. Upon completion of the Project, the Contractor shall submit one set of Contract Prints with red marks indicating As-built conditions of all piping and equipment, and incorporating changes made during construction. A record of as-built conditions shall be kept throughout the Project and shall be used in the preparation of the Final Record Drawings.

B. The Contractor shall provide digital images (minimum resolution of 1152 x 864 pixels in JPEG standard image file format) delivered via email or on CD, of any utilities/piping that are installed underground with a reference drawing indicating which direction each picture is taken. The reference drawing shall dimension the utility/piping from a prominent fixed object.

1.09 WARRANTIES AND GUARANTEES

A. The materials of the plumbing systems shall have the Manufacturer’s and/or supplier’s Guarantee or Warranty put into effect by execution and filing of any and all related papers. Minimum warranty shall be for one (1) year from date of Substantial Completion. If the manufacturer’s standard warranty is for a longer period, it shall apply.

B. The installed plumbing systems shall be delivered to the Owner in proper working order. Contractor shall warranty the plumbing system for a period of one (1) year, replace any work or material, which develops defects, excluding normal wear and tear, from the date of Substantial Completion.

C. Warranties and Guarantees shall be furnished in exact conformity with the requirements of the Contract.

1.10 OPERATING INSTRUCTIONS

A. Instructions: Instruct the Owner's representative in operation of the installed systems. The basis of these instructions shall be those written for inclusion in the maintenance and operating instruction data specified herein. Obtain certificates, signed by the Owner's representative, that these instructions have been received.

1.11 DOCUMENTATION

A. Documents to be submitted prior to request for final inspection:

1. Maintenance Manuals per Specification Section 22 01 00.
2. Three copies of multi-year warranties and guarantees bound in a brochure with index listing equipment.

B. Data to be Delivered at Final Inspection:

1. Record Drawings.
2. Images of underground piping/utilities and related reference drawing.
3. Certificate by Owner's representative confirming that operating instructions have been received.

1.12 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Submittal data covering the work of this Division will be reviewed only after such items have been reviewed in detail and approved by the Contractor, such approval being indicated by suitable notations or stamp on the data.

C. Each submittal shall be clearly marked indicating Section and paragraph for which it is intended. Any deviations, exclusions or substitutions from specified material requirements shall be specifically identified in a summary sheet at the front of the submittal.

D. Where submittal sheets contain multiple products or selections, the specific item being submitted for review shall be clearly indicated with a red arrow (stamped or hand written). “Catalog” submittals (multiple items contained in the submittal, specific items not identified) will be rejected and not reviewed.

E. Submit the requested submittals in sufficient quantity to provide two copies in addition to those required by Contractor.

F. All pump submittals shall include performance curves indicating flow, pressure, efficiency, and power requirements. For pumps, adjacent impeller selections shall be included.

G. Motor Tabulation on all motors furnished listing the following nameplate data: Horsepower, voltage, phase and full load amps.

H. Submittal List: See the individual Mechanical Specification Sections for specific submittal requirements.

END OF SECTION 22 00 10

SECTION 22 01 00
OPERATION AND MAINTENANCE OF PLUMBING

PART 1 – GENERAL

1.01 PROVIDE MANUAL IN NUMBER OF COPIES INDICATED UNDER SPECIFICATION SECTION 22 00 10 – GENERAL PROVISIONS - PLUMBING.

1.02 MATERIAL SUBMITTED IN THE MANUALS SHALL REPRESENT THE EQUIPMENT MANUFACTURER, MODEL, AND TYPE INSTALLED ON THE PROJECT.

PART 2 – PRODUCTS

2.01 MAINTENANCE AND OPERATING MANUALS SHALL CONSIST OF THE FOLLOWING AS A MINIMUM

A. Hardback three ring binders with job name and Owner's name on cover.

B. Typed index listing name, address, and phone number of the Contractor, Contractor's Plumbing Subcontractor, Contractor's Insulation Subcontractor, and all major equipment suppliers.

C. Typed table of contents, listing each section, title, and number.

D. All Sections shall be tabbed with plastic tabs listing Section numbers.

E. Each item of equipment requiring maintenance and operation data as noted in each specification section shall be provided with an index listing the types of equipment installed. Submittal data shall be included to the extent necessary to identify equipment, including summary sheet, such as model, size, water flow, pressure developed, speed, and motor size. Instructions shall include type and suggested frequency of maintenance, oiling, cleaning, disassembly, and reassembly directions, and wiring diagrams.

F. One section shall include a complete set of Record Control Drawings, bound in a plastic insert, full size, complete with a written sequence of operation for all control systems.

Letters, where factory startup or checking has been required, certifying completion of performance.

PART 3 – EXECUTION

3.01 ALL MAINTENANCE AND OPERATING MANUALS SHALL BE COMPLETE AND READY TO TURN OVER TO OWNER'S REPRESENTATIVE AT FINAL INSPECTION.

3.02 INCOMPLETE MANUALS WILL BE RETURNED TO THE CONTRACTOR FOR COMPLETE RESUBMISSION. LOOSE LEAF SUBMITTAL OF MATERIAL AT VARIOUS STAGES OF COMPLETION WILL NOT BE ACCEPTABLE.

END OF SECTION 22 01 00

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING -

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section of specifications deals with materials and methods pertaining to all work specified under Division 22.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Plumbing Valves and Strainers”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide submittal data showing starter dimensions, weight, electrical requirements, and service access requirements.

C. Provide submittal data showing motor horsepower, electrical requirements, and efficiency.

D. Provide submittal data showing firestop systems, including details for penetrations and instructions for installation

E. Provide manufacturer’s instructions, indicate installation and support requirements.

1.04 JOB CONDITIONS

A. Install all apparatus so as to maintain maximum headroom and clearances consistent with requirements of the Drawings and specifications.

B. All equipment requiring service shall be installed to permit access for servicing without damage to building structure or finishes.

PART 2 – PRODUCTS

2.01 SUPPORTS AND HANGERS

A. Individual horizontal piping shall be supported as follows:

1. Steel and cast iron piping with painted clevis hangers.
2. Hangers in contact with copper piping shall be copper plated swivel ring type.
3. Hangers around insulated copper piping shall be painted clevis or galvanized steel swivel ring type.
4. Copper piping exposed adjacent to structure shall be secured with copper plated pipe clamp.
5. All attachments in contact with copper piping shall be copper, copper plated or plastic coated.

6. Horizontal, parallel and adjacent piping shall be supported by gang hangers utilizing PVC coated channel and PVC coated standard pipe clamps or approved equal.
7. Hangers for PVC water piping shall be galvanized steel swivel ring type.

B. Concealed vertical piping shall be supported as follows:

1. Steel and cast iron piping with painted riser clamps.
2. Copper piping with copper plated riser clamps.

C. Exposed Vertical Piping shall be supported by attachment to wall at midpoint with offset pipe clamps. Clamp for uninsulated copper piping shall be copper plated or plastic coated.

D. Pipe in Chases:

1. Piping in pipe chases shall be secured to building structure using attachments hereinbefore specified. Hangers for water piping within plumbing chases shall be supported with rods bolted to pipe clamps which shall be affixed to cast iron pipe. Piping may be supported from the more rigid cast iron pipe with the use of plastic brackets designed for that purpose.
2. Rough-in stubs through partitions to fixtures (in particular to flush valves and shower heads) shall be securely anchored by means of an attachment secured to wall or cast iron pipe.

E. Hangers and pipe attachments for sprinkler systems and standpipes shall meet the requirements of NFPA 13 and NFPA 14 respectively.

F. Hangers and pipe attachments, except where otherwise specified shall be Elcen, Hilti, Michigan Hanger Company, B-Line, or Grinnell.

2.02 STRUCTURAL ATTACHMENTS

A. Inserts:

1. Individual inserts shall be malleable iron type selected for the type and thickness of the slab and the load to be carried.
2. Continuous inserts shall be formed galvanized steel type selected for the type and thickness of the slab and the load to be carried. Inserts shall be furnished with end caps, closure strips and shall be anchored at 6" O.C.
3. Inserts shall be used in poured in place concrete slabs.
4. Inserts shall be Elcen, Michigan Hanger, Grinnell, or B-Line.

B. Concrete Fasteners:

1. Fasteners shall be self-drilling type, Locke Mfg. Co. "Bull Dog", Phillips "Red Head", or Diamond "Blue-Cut".
2. Fasteners shall be used in solid masonry walls and shall be used in solid concrete walls.

C. Toggle Bolts with not less than 1/4" diameter bolts shall be used in hollow type wall construction.

D. Clamps of configuration compatible with beams and steel members shall be used in steel construction. Clamps shall be Grinnell, Michigan Hanger Company, Elcen, or B-Line.

E. Hanger rods shall be selected to safely carry the load to be supported and shall not be less than the diameter listed by the hanger manufacturers for the specific size hanger used.

2.03 FOUNDATIONS

A. Provide reinforced concrete foundations for all equipment located on floors, 4" high unless noted otherwise.

B. Concrete shall be 1:2:4 mix with neatly beveled edges and all surfaces rubbed smooth prior to mounting equipment. Foundations shall be reinforced with No. 3 bars a maximum of 12" o.c. each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate the slab waterproofing.

2.04 ACCESS PANELS

A. Access panels shall be flush concealed hinge and latch type complete with frame. Panels shall be minimum 18" x 18", selected for the specific type of ceiling or wall where installed. Locks shall be flush screw turn type.

B. Panels shall be primed for finish painting in ceilings or walls to be painted.

C. Panels installed in rated walls or ceilings shall be U.L. listed for the same rating as the wall in which they are to be installed, except 1½ hour panels are acceptable in two (2) hour walls.

2.05 PAINTING

A. Primers shall be acrylic, corrosion resistant type, selected for the metal or other surface to be painted, with a maximum VOC emission of 150 grams per liter. Sherwin-Williams Pro-Cryl Universal Primer or equal.

B. Topcoats shall be acrylic latex base, selected for the material, surface and operating temperature of the equipment or apparatus to be painted, with a maximum VOC emission of 150 grams per liter for non-flat finishes and 50 grams per liter for flat finishes. Sherwin-Williams Pro-Mar 200 (interior metal, black-out), Sherwin-Williams SuperPaint (exterior metal), or equal.

2.06 FIRESTOP SEALANT

A. Firestop Sealant shall be as specified in Specification Section 07 84 00 “Firestopping”.

2.07 ASBESTOS

All materials used in this work shall be asbestos free.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All work shall be installed plumb and square unless clearly indicated otherwise. Installation shall be performed by competent persons, trained in their respective skills.

B. Furnish and install equipment complete, including connections, services and adjustments for systems to operate safely and in compliance with requirements of the Contract.

C. Install each item in full compliance with current recommendations of the manufacturer. Equipment manufacturer or his authorized representative shall furnish services and/or supervision necessary to ensure compliance with this provision. Conflict between manufacturer's recommendation and other Contract requirements shall be resolved before installation.

D. Requirements of the several acceptable manufacturers for each specified item of equipment may vary as to installation details, location and number of connections, dimensions and weight. Provide all drawings, services, material, and labor necessary for the installation and proper functioning of the equipment furnished.

3.02 PROTECTION OF MATERIALS AND EQUIPMENT

A. Take precautions to protect all materials and equipment from damage during the construction process.

B. Do not store materials and equipment outdoors subject to weather without complete weather protection.

C. Do not install materials or equipment in a partially constructed structure exposed to weather, unless all material and equipment is continuously protected from damage by weather or the construction process.

D. Material and equipment damaged by improper protection during construction is subject to replacement based on the judgment of the Architect’s Engineer at no cost to the Owner.

3.03 CUTTING AND REPAIRING

A. Cut and repair all walls, floors, and ceilings necessary for the installation of the mechanical work, but no cutting of work of other trades will be permitted without the consent of the Architect or his representative.

B. All cutting and repairing of walls, floors, and ceilings shall be subject to the supervision and approval of the Contractor.

3.04 CLEANING AND FINAL CLEAN-UP

A. Keep the premises free of waste, debris and surplus materials.

B. After equipment has been installed, remove all extraneous materials, rust and stains; blow, vacuum or flush all foreign matter from all equipment.

C. Identification plates on equipment shall be free of paint and shall be polished.

3.05 EXCAVATION AND BACKFILL

A. Do all trenching, excavating and backfilling required for the Mechanical Sections. Include all necessary repairing, shoring, bracing, pumping and protection for safety of persons and property. Repairing shall be comparable to work cut and shall be approved by the proper authorities.

B. Slope sides of excavations to comply with OSHA regulations and local ordinances having jurisdiction. Shore and brace where sloping is not possible either because space restrictions or stability of materials excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. Care shall be taken to avoid existing facilities in excavating. Contractor shall be responsible for all damage to existing facilities in executing this work.

D. Excavate rock to depth of 6" below bottom of pipe. Space between rock and pipe shall be filled with sand.

E. Bottom of trenches shall be graded to secure the required fall. Size of bell holes for soil and sewer pipe shall be held to a minimum so that the entire pipe length rests on compacted fill or undisturbed earth.

F. Backfill shall be placed completely under pipe haunches and in bell holes and uniformly tamped in 6" layers. Backfill over top of pipe with select materials free of clods, stones, boulders, and foreign materials. Back fill shall not be installed until pipe is insulated, tested and field inspected by inspector.

G. Backfill shall be compacted to 95% of maximum dry density as determined by a Standard Proctor Test, ASTM-D698, except where under areas to be paved, top 12 to 24 inches of fill shall be compacted to 97% dry density by above standard.

3.06 PIPING SUPPORTS AND ANCHORS

A. Waste, drain and relief valve discharge piping shall be securely anchored to structure, equipment or concrete base. Piping shall be located with two inches clear above the floor.

B. Combination riser clamps may be used where more than one pipe passes through floors.

C. Riser clamps for support of risers shall span penetration of slot or sleeve in floor. In exposed location, use short span clamps.

D. Hang all piping so that equipment flanges and connections bear none of weight of piping. At pump suction and discharges, piping shall be supported free of pump casing through the use of base elbows.

E. Horizontal supports shall be spaced as follows:

1. Steel piping at not more than 10' intervals.
2. Cast iron piping at 5' intervals, except supports shall be placed at intervals equal to the pipe length but not to exceed 10'. Also, no hub pipe over 3" size shall be supported at each change from horizontal to vertical or vertical to horizontal direction.
3. Copper piping 1-inch and smaller at 8' intervals; larger than 1-inch at 10' intervals.
4. PVC piping at not more than 4’ intervals.

F. Vertical supports shall be spaced as follows:

1. Steel piping at every other story height.
2. Copper piping larger than 1-inch at every other story height; 1-inch and smaller at every story height.
3. Cast iron, piping at every story height. Cast iron pipe stacks shall be supported with concrete piers at the base of stacks over two stories.
4. In addition, no-hub cast iron and gasketed cast iron piping shall be supported and/or guided at midpoint of each story height.

G. Sprinkler piping and standpipe shall be supported and anchored as required by NFPA 13, 1996, and NFPA 14, 1996 respectively.

3.07 HANGER SIZES

A. Hangers shall be sized to fit the pipe except for the insulated piping, in which case hangers shall be of size for pipe and insulation to pass through.

B. See Insulation for Pipe Saddles. See 22 07 00 Plumbing Systems Insulation specification section.

3.08 STRUCTURAL ATTACHMENTS

A. Inserts shall be used for individual loads exceeding 150 lbs. Concrete fasteners may be used where approved in writing by Architect for individual loads of 150 lbs. or less.

B. Inserts shall be secured to the forms before the pouring of concrete. In all spaces with exposed concrete ceilings, the openings not filled with rods and nut shall be filled with cement grout flush with the ceiling.

C. Shooting of fasteners into the slab shall be allowed only in approved locations.

D. Devices for connection to the structure shall not be loaded more than 75% of the manufacturer's rated load.

3.09 ACCESS PANELS

A. Access panels shall be installed at all points where equipment, devices or apparatus requiring adjustment, maintenance or servicing cannot be readily accessed through the ceiling or wall.

B. Accessible ceilings are defined as lay-in frame type and access panels are not required for equipment or apparatus above these ceilings.

C. Panels shall be located so that apparatus or equipment can be reached by an arm's length.

3.10 PAINTING

A. Except where otherwise specified, painting shall be done under another Division. Surfaces shall be left clean and free from oil.

B. Finishes of factory painted apparatus shall be touched up where finish is marred in installation.

C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.

D. Interior ferrous pipe and supports exposed to view without removing ceilings or access panels shall be primed and topcoated with two coats of semi-gloss paint, color selected by Architect.

E. Exterior ferrous piping and supports shall be primed and topcoated with two coats exterior satin finish paint, color selected by Architect.

3.11 FIRESTOP SEALING FLOOR AND WALL PENETRATIONS

A. Where piping, control tubing, and conduit penetrate fire or smoke rated walls and floors, the penetration shall be sealed with fire barrier herein specified.

B. Fire barrier shall be installed in strict accordance with manufacturer's printed instructions. Material shall be installed with sufficient depth to maintain a fire endurance rating equivalent to that of the adjacent wall or floor.

3.12 LUBRICATION

A. All equipment installed under this division shall be properly lubricated in accordance with the manufacturer’s instructions and recommendations before it is operated during the installation period, and shall be checked again before final acceptance.

END OF SECTION 22 05 00

SECTION 22 05 23
PLUMBING VALVES AND STRAINERS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the valves and strainers common to the plumbing piping systems of Division 22. HVAC, fire protection, and other specialty valves and accessories are specified in other Sections of Division 22.

1.02 RELATED SECTIONS

A. Division 22 Section “Common Work Results for Plumbing”

B. Division 22 Section “Pipe Fittings and Accessories – Plumbing”

C. Division 22 Section “Plumbing Piping and Drainage Accessories”

1.03 QUALITY ASSURANCE

A. All gate, globe and check valves provided under Mechanical Sections shall be of the same manufacture, except as otherwise specified.

B. All other valves of a given type shall be by the same manufacturer.

C. All valves shall have asbestos-free packing and gaskets.

All valves and fittings shall be of Lead Free construction. Lead Free refers to less than 0.25% weighted average lead content in relation to wetted surface of pipe, fittings and fixtures in systems delivering water for human consumption. Any product designed for dispensing potable water shall meet both the NSF/ANSI 61 and NSF/ANSI 372 test standards via third party testing and certification.

PART 2 – PRODUCTS

2.01 GATE VALVES

A. Valves 2" and under shall be class 125 all bronze construction valve with solder ends, rising stem, block pattern, union bonnet, solid wedge, 200 psi non shock cold working pressure conforming to MSS SP-80 downstream of pressure reducing valve and class 150 valve rated for 250 psi non shock cold working pressure upstream of PRV.

B. Valves 2½" and over shall be class 125 iron body, flanged, non-rising stem, solid wedge, bronze trimmed, bolted bonnet, and 200 psi non shock cold working pressure conforming to MSS SP-70 downstream of pressure reducing valve and class 150 valve rated for 250 psi non shock cold working pressure upstream of PRV.

C. Valves shall be Hammond, American, Milwaukee, Nibco, Powell or Stockham/Crane.

2.02 GLOBE VALVES

A. Valves 2" and smaller shall be class 125 all bronze valve with solder ends, union bonnet, composition or Teflon disc for selected service, 200 psi non shock cold working pressure conforming to MSS SP-80 downstream of pressure reducing valve and class 150 valve rated for 250 psi non shock cold working pressure upstream of PRV.

B. Valves 2½" and larger shall be class 125 iron body, flanged, bronze trimmed, bolted bonnet, solid disc, and 200 psi non shock cold working pressure conforming to MSS SP-85 downstream of pressure reducing valve and class 150 valve rated for 250 psi non shock cold working pressure upstream of PRV.

C. Valves shall be Hammond, American, Milwaukee, Nibco, Powell or Stockham/Crane.

2.03 BALL VALVES

A. Ball valves 2" AND UNDER shall be full port rated for 150 psi saturated steam and 600 psi non shock cold working pressure conforming to MSS SP-110 with cast bronze body, chrome plated ball, reinforced PTFE seal (15% glass filled), brass stem, and zinc coated extended steel handle with vinyl handle hand grip, and soldered connections. Ball valves shall be American, Apollo, Hammond, Milwaukee, Nibco or Stockham/Crane.

2.04 CHECK VALVES IN HORIZONTAL PIPE

A. Valves 2" and under shall be class 125 all bronze valve with horizontal swing, y-pattern, renewable seat and disc, solder ends, with full flow area, 200 psi non shock cold working pressure conforming to MSS SP-80.

B. Valves 2½" and larger shall be class 125 horizontal swing type check valve with cast iron body, flanged, bolted cap, with bronze trim and renewable seat and disc, 200 psi non shock cold working pressure conforming to MSS SP-71, Type 1.

C. Seats shall be selected for domestic water service.

D. Valves shall be Hammond, American, Jenkins, Milwaukee, Nibco, or Stockham/Crane.

2.05 CHECK VALVES IN VERTICAL PIPE

A. Valves 3" and under shall be bronze construction, silent spring type, solder ends with stainless steel spring and resilient seat. Valves shall be class 125 rated for 200 psi non shock cold working pressure.

B. Valves 4” and over shall be silent cast iron body wafer type, flat face, bronze trimmed, with stainless steel spring and resilient seat. Valves shall be class 125 rated for 200 psi non shock cold working pressure.

C. Seats shall be selected for domestic water service as required.

D. Vertical check valves shall be Mueller, American, Milwaukee, Mission, Nibco or Stockham/Crane.

2.06 PRESSURE REDUCING VALVES

A. Pressure regulating valves shall be self contained direct operating type with low lead bronze body, stainless steel seat, stainless steel spring, sealed spring cage, and bronze body strainer with 20 mesh stainless steel strainer and stainless steel spring. Regulator shall be NSF Listed – Standard 61, Annex G and constructed in accordance with ASSE standard 1003 and shall bear the seal of approval. Capacities shall be based on a maximum pressure fall off of 10 psig.

B. Valves ½" to 2-1/2" shall be Watts Series LF223S or by Spence Engineering or A.W. Cash Company.

2.07 WATER TEMPERING VALVES

A. (MV1) Single Hi-Lo thermostatic mixing valve shall be ASSE 1017 listed. Valve shall have thermal actuator and expandable restrictor, dirt and lime resistant poppet, seat, heavy duty strainer check stops, self aligning bronze trim and seats and temper-resistant temperature adjustment control. Mixing valve shall be capable of providing minimum of 0.5 gpm tempered water and valve shall be rated for 125 psig service. Valves shall have a mixed temperature adjustment range of 40°F. to 160°F. and setpoint shall be field adjustable. Valves shall be Powers HydroGuard XP Series LFSH1430 or comparable by Symmons, Leonard, Bradley or Lawler.

B. (TMV) Thermostatic mixing valve shall be ASSE 1070 listed. Valve must control each performance standard down to 0.5gpm. Valve shall be constructed of solid brass and temperature must be adjustable between 80°F and 120°F with locking nut to prevent unauthorized adjustment. Valve shall be set to deliver 90°F tempered water. Valve shall be Powers LFe480 for single lavatory use or Powers LM 49# series where installed above the ceiling. Comparable products by Leonard, Symmons or Wilkins.

2.08 BACKFLOW PREVENTERS

A. Hose Connection Vacuum Breaker: Provide on each hose bibb a lead free bronze body non-removable backflow preventer. Preventer shall be Watts Series LF8 series.

B. Anti-Siphon Vacuum Breaker: Watts No. LF288A breaker with lead free angle bronze body and internal trim and brass external trim.

C. Backflow preventers shall be manufactured by Ames, Febco, Hersey, Watts or Zurn Wilkins.

2.09 BALANCING VALVES

A. Lead Free, 2" and smaller shall be bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F; Nibco S-1709 or S-1710 Series or comparable products by Bell & Gossett, Taco or Armstrong.

2.10 GAS VALVES

A. Gas valves shall be lubricated plug type meeting requirements of ANSI/ASME B16.33 with semi steel body and removable handle rated for 125 psig. Valves shall be threaded in size 2" and under and flanged over 2" size.

2.11 GAS PRESSURE REGULATORS

A. Pressure regulators shall be spring loaded adjustable regulator with cast iron body, brass orifice, Buna-N or silicone valve seat, steel valve stem with inlet and outlet rated for pressure and capacity noted on the plans. Regulators shall maintain a reduced outlet pressure under lockup (no-flow) conditions. Regulators installed on the exterior of the building shall be approved for outdoor installation. Regulators installed indoors shall be approved for indoor installation without a vent connection.

2.12 STRAINERS

A. Strainers 3" and smaller shall be all bronze, solder ends, 'Y' type complete with screwed cap and basket rated for 200 psi water, oil, gas at 150°F non shock cold working pressure.

B. Strainer baskets shall be as follows:

Service	Material	Perforation	Open Area
Domestic Water	Brass	1/10"	35%

C. Strainer shall be Mueller, Keckley, Stockham/Crane, or Hoffman.

PART 3 – EXECUTION

3.01 VALVE INSTALLATION

A. Install valves in accessible locations with stems located in horizontal or vertical positions. Gate and globe valves shall be installed with the valve stem pointing upward.

B. Install a gas valve and union at each piece of equipment.

C. Gas pressure regulators shall comply with the following:

1. Pressure regulators shall be provided with access and protected from physical damage.
2. Where located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak limiting device. Pressure regulators that require a vent shall have an independent vent to the outside of the building. The vent shall be designed to prevent the entry of water or foreign objects.
3. A tee fitting with one opening capped or plugged shall be installed between the regulator and its upstream shutoff valve. The tee fitting shall be positioned to allow connection of a pressure measuring instrument and to serve as a sediment trap.
4. A tee fitting with one opening capped or plugged shall be installed not less than 10 pipe diameters downstream of the pressure regulator outlet. The tee fitting shall be positioned to allow connection of a pressure measuring instrument.

END OF SECTION 22 05 23

SECTION 22 05 48
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION

A. General provisions and other systems are specified in other sections of Division 22.

B. This section outlines requirements for seismic restraints for mechanical equipment.

1.02 STANDARDS

A. International Building Code (IBC), 2012 Edition with Georgia Amendments

B. American Society of Civil Engineers, ASCE Standard ASCE/SEI 7-10 “Minimum Design Loads for Buildings and Other Structures".

1.03 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Plumbing Piping and Drainage Accessories”

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide product data showing materials provided (anchors, cables, etc.).

C. Provide calculations for hanger and anchors showing operating loads, required seismic loading, and ultimate load allowed on anchor. Required loading shall not exceed percentage listed herein of anchor ultimate load allowed.

D. Provide scaled floor plan drawings showing locations and types of seismic restraints required.

E. Provide manufacturer’s certificate of seismic force compliance for all non-exempt mechanical equipment.

F. Any exempt system or component shall be listed, along with the corresponding Building Code Section allowing the exemption.

G. Provide Project-specific design and documentation for plumbing components and designated seismic systems and their supports and attachments in compliance with ASCE/SEI 7-10. design and documentation shall be:

H. Prepared, stamped and signed by an Engineer registered in the same State as the Project location or

I. Submittal of the Manufacturer's certification that the equipment is seismically qualified as listed in ASCE/SEI 7-10 Section 13.2.1.2.

J. Provide a quality assurance plan for seismic requirements for all mechanical components and designated seismic systems as listed below in section 22 05 48 3.01. Plan shall be stamped and signed by an Engineer registered in the same State as the Project location. Quality Assurance Plan shall meet the requirements in ASCE/SEI 7-10 Appendix 11A.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Piping systems, including their supports, designed and constructed in accordance with ASME B31.

B. Specialty seismic hangers, supports and restraint equipment shall be by Amber-Booth, Mason or Vibration Isolation Co.

C. Sheetmetal straps shall be galvanized steel as specified in Specification Section 23 31 00 DUCTWORK.

D. Hangers shall be as specified in Specification Section 23 05 00 COMMON WORK RESULTS FOR HVAC.

E. Cables shall be wire coil, zinc coated to 0.4 ounces/ft² or A304 stainless steel. Strength of cables shall be minimum as follows:

Size, Inches	Breaking Strength, Pounds
1/4" (minimum size)	4,940
3/8"	10,980
1/2"	19,260

F. Hot rolled steel shapes shall conform to ASTM 36. Pipe used as restraints shall be constructed per ASTM A-120 or A53.

G. Bolts shall conform to ASTM A307.

PART 3 – EXECUTION

3.01 MECHANICAL EQUIPMENT REQUIRING RESTRAINTS

A. The following equipment shall require seismic restraints meeting the requirements of ASCE/SEI 7-10 Chapter 13, except where the requirements of the exceptions listed below are met.

1. All equipment, piping and systems shall be needed for the continued operation of the facility and thereby shall be require seismic restraints as listed in ASCE/SEI 7-10 section 13.1.3.3. Components and their supports shall meet the requirements of ASCE/SEI 7-10 section 13.6.
2. Seismic restraints exceptions as listed in ASCE/SEI 7-10 section 13.6.8.3 (Piping).
3. Seismic restraint exception in ASCE/SEI 7-10 section 13.6.8.2 states that fire protection piping, pipe hangers and bracing designed and constructed in accordance with NFPA 13 shall be deemed to meet the requirements of this section.

B. Designated Seismic Equipment: Certifications shall be provided for designated seismic systems in accordance with ASCE/SEI 7-10 requirements.

C. All building HVAC, plumbing and fire protection equipment, ductwork, piping and associated hangers and restraints are required to remain operable following the design earthquake, and shall be considered designated seismic equipment.

D. Risk Category = IV

E. Seismic Design Category = C

F. Spectral Response Acceleration Parameter in Short Period SDS = 0.183.

3.02 SUPPORT REQUIREMENTS

A. Seismic support shall be provided for both transverse and longitudinal restraint.

B. Seismic attachments shall transfer the seismic force to the building structure. The attachments shall be positively secured, supports using frictional resistance are prohibited.

C. Loading for sizing hangers, supports, and attachments shall comply with the requirements of ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures" using the following criteria:

Sds = design spectral response acceleration at short period, which = 0.183 for this specific building.
Ip = the importance factor for the component, which = 1.5 for all systems on this Project.

D. Hangers, cables, and angle supports shall not be preloaded or tensioned, but snug and not slack.

E. Seismic restraints shall be installed per the Seismic Restraint submittal data. Refer to this documentation for restraint locations, specific attachment details, hanger sizing and support requirements.

END OF SECTION 22 05 48

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the identification requirements for the plumbing systems.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Common Work Results for Plumbing”

C. Division 22 Section “Plumbing Piping and Drainage Accessories”

1.03 SUBMITTALS

A. General: Submittal shall be in accordance with Specification Section 01 33 00.

B. Product Data: Submit manufacturer’s technical product data and installation instructions for each identification material and device required.

C. Schedules: Submit valve schedule for each piping system, typewritten and produced on 8½” x 11” bond paper. Include valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and any variations for identification. If addition to framed copies, furnish extra copies for maintenance manuals as specified in Division 1.

1.04 SUMMARY

A. Section includes:

1. Pressure Sensitive Adhesive Pipe Markers.
2. Underground Warning Tape.
3. Valve Tags and Schedules.
4. Engraved Equipment Markers.

1.05 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A13.1-1985 –Scheme for the Identification of Piping Systems.

B. Department of Labor 29 CFR 1910.1200.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification products of types and sizes required, whose products have been in satisfactory use for a period of five (5) years.

Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification products.

PART 2 – PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

A. Provide manufacturer's standard products for each application as referenced in this section.

2.02 PIPE MARKERS

A. Pressure-Sensitive Type: Provide manufacturer's standard preprinted, permanent adhesive, color-coded pressure sensitive vinyl labels complying with ANSI A13.1. Color-coded plastic adhesive flow directional arrow tape, full circle at both ends of the pipe marker, tape overlapped 1-1/2". Use 1" tape for piping less than 2-1/2", 2" tape for 2-1/2" thru 8" piping; and 4" tape for larger piping.

B. Lettering: Comply with ANSI A 13.1 for piping system nomenclature. Abbreviate only as necessary to accommodate marker length.

2.03 UNDERGROUND TYPE PLASTIC LINE MARKERS

A. Metallic Piping: Provide manufacturer's standard non-detectable permanent, continuous printed plastic tape, intended for direct burial service, not less than 3" wide by 4 mils thick. Provide tape with printing most accurately indicating type of service of buried pipe.

B. Non-Metallic Piping: Provide manufacturer's standard detectable, multi-ply tape consisting of solid aluminum foil core between 2 layers of plastic tape, not less than 3" wide by 5 mils thick. Provide tape with printing most accurately indicating type of service of buried pipe.

2.04 VALVE TAGS

A. Plastic Tags: Provide manufacturer's standard 1/16" plastic engraved tags, 1½" square, black with white lettering, with ¼" high service indicator on top line and ½" numbers below.

B. Valve Tag Fasteners: Use solid brass "S" hooks for installation of valve tags.

C. Chart Frames: Provide one (1) aluminum 8 ½" x 11" valve chart frame with glass lens for each valve schedule provided.

D. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic access panel markers with abbreviations and numbers corresponding to the concealed valve.

2.05 ENGRAVED PLASTIC EQUIPMENT MARKERS

Provide manufacture's standard 1/16" engraved equipment tags matching the terminology on schedules as closely as possible. Use black with white letters, 1" x 3" or 1 ½" x 4" for control devices, and valves and 4" x 6" for equipment. Use green with white letters, 3" long x the ceiling grid width for equipment above lay-in ceilings.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Where identification is to be applied to surfaces requiring painting, insulation, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 MARKER LOCATION

A. Install pipe markers on each system indicated, include arrows showing normal direction of flow.

B. Schedule of Piping Identification:

Piping Systems and Contents	Tape Background Color	Stenciled Legends
<u>Water Supply</u>		
Domestic Cold Water	Green	Cold Water Domestic
Domestic Hot Water	Yellow	Hot Water Domestic
Recirculating	Yellow	Hot Water Recirculating
<u>Gas Systems</u>		
Gas	Yellow	Natural Gas
Compressed Air	Blue	Compressed Air
<u>Drainage</u>		
Sewerage	Green	Sanitary Sewer
Waste	Green	Waste
Vent	Green	Vent

C. Locate pipe markers and/or color bands (if required) wherever piping is exposed to view, and at least one marking per room above suspended ceilings. Per the following:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units mark each branch where there might be a question of flow direction.
3. Near locations where pipes pass through walls, floors, or ceilings or where they enter non-accessible locations.

4. Behind removable panels and other access points permitting view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. On piping above removable acoustical ceilings.
7. At maximum intervals of 40’ along each straight pipe run, except to 25’ in congested areas.

3.03 UNDERGROUND PIPE IDENTIFICATION

A. During backfilling of each exterior underground piping system, install continuous underground plastic line markers directly over buried line at 6” to 8” below finished grade. Where multiple small lines are buried in a common trench and do not exceed and overall with of 16” install a single line marker.

3.04 VALVE IDENTIFICATION

A. Provide a valve tag on every, cock, and control device in each piping system. Exclude check valves, valves within factory fabricated equipment units, plumbing fixture faucets, convenience and lawn watering hose bibs, shut-off valves at plumbing fixtures. List each tagged valve in a valve schedule for each piping system.

3.05 EQUIPMENT IDENTIFICATION

A. Install engraved plastic signs or equipment markers on or near each major item of mechanical equipment and each operational device, per the equipment schedule. Attached tag to the ceiling grid directly under equipment installed above lay-in ceilings. Provide markers for the following general categories of equipment and operational devices.

1. Main control and operating valves including safety devices and hazardous units.
2. Meters, gauges, thermometers, and similar units.
3. Fuel burning units including boilers and heaters.
4. Pumps and similar motor driven units.
5. Tank and pressure vessels.
6. Strainers, filters, water treatment systems, and similar equipment.

B. Method of Installation: Use stainless steel screws except where adhesive is necessary because substrate cannot or should not be penetrated. Use rivets for tags attached to the ceiling grid.

END OF SECTION 22 05 53

SECTION 22 07 00
PLUMBING INSULATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Insulation specified in this Section is for insulation used in Division 22 work.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Plumbing Piping and Drainage Accessories”

1.03 DEFINITIONS

A. Exposed piping is work that can be seen when the building is complete without opening or removing access doors or panels.

B. Other piping is considered to be concealed.

1.04 INSPECTION

A. Surfaces to be insulated shall be clean, dry, and free of foreign material, such as rust, scale and dirt when insulation is applied. Perform pressure tests required by other Sections before applying insulation.

1.05 QUALITY ASSURANCE

A. Products of the manufacturers listed will be acceptable for use for the specific functions noted. All materials shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

B. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

C. Insulation shall be applied by experienced workers regularly employed for this type work.

1.06 RATING

A. Insulation and accessories, unless specifically exempted, shall have a composite flame-spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested as assembled. Materials that are field applied may be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

B. Flame Spread and Smoke Developed Ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, ASTM E-84, latest edition or U.L. 723.

C. Products or their shipping cartons shall bear a label indicating flame spread and smoke developed ratings.

D. Treatment of pipe jackets to impart flame and smoke safety shall be permanent.

1.07 ASBESTOS

All materials used in this work shall be asbestos free.

PART 2 – PRODUCTS

2.01 INSULATION APPLICATIONS

A. Pipe Insulation – Denoted by Type P:

1. Interior concealed Domestic Cold water:

a. Type P3 Glass fiber, 1/2” thick.

2. Interior exposed Domestic Cold water:

a. Type P3 Glass fiber, 1” thick.

3. Domestic Hot water and Circulating Hot water, interior installations:

a. Type P3 Glass fiber, 1” thick for piping up to 2” diameter and 1-1/2” for piping larger than 2”

4. Interior, horizontal Waste piping receiving condensate from HVAC equipment:

a. Type P3 Glass fiber, 1” thick.

2.02 ACCESSORY MATERIALS

A. Low VOC adhesives, sealants and mastics shall be selected as recommended by the insulation manufacturer. Adhesives shall be water based, and must comply with the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168, with a maximum VOC emission of 70 grams per liter. Low VOC water based sealants and mastics shall be manufactured to comply with NFPA 90A, U.L. listed and complying with ASTM E84 and comply with the current VOC limits of the SCAQMD Rule #1168, with a maximum VOC emission of 250 grams per liter. They shall be manufactured by the insulation manufacturer or by Foster, Flintkote, Hardcast, Insul-Coustic, Lion Oil or 3M.

B. Adhesives, sealants and mastics which secure a vapor barrier material shall be of the vapor barrier type.

C. Adhesives, sealants and finishes for surfaces above 70°F shall be of the "breather" type.

D. Insulation jackets shall have a vapor barrier when applied to surfaces subject to sweating in an ambient environment up to 90°F D.B. and 80°F W.B.; including domestic cold water, rainwater, and waste piping receiving condensate discharge.

E. Where specified, finish jackets for all insulation in the building shall be not less than 8 oz./sq. yd. white, pre-sized glass cloth kraft paper reinforced by Carolina or Twinsburg-Miller.

F. All finish mastics and sealants shall be white in color, unless noted otherwise.

G. Staples shall be "outward clinch" or "flare" type.

H. Galvanized steel wire shall be 20 gauge.

I. Stainless steel wire shall be 20 gauge.

2.03 INSULATION PIPE SHIELDS

A. Shields shall be galvanized rolled to form a 180° arc. Length of shields shall conform to the following:

Insulation O.D.	Shield Length	Shield Gauge
0-4 inch	12 inch	14 gauge
5-9 inch	18 inch	14 gauge
10-19 inch	24 inch	12 gauge
Over 20 inch	30 inch	12 gauge

2.04 INSULATION DESIGNATION

A. Type P3 shall be Glass Fiber Insulation, suitable for interior application.

1. Insulation shall be composed of high-density glass fibers bonded with a thermosetting resin. Operating temperature range shall be 0°F to 850°F. Mean thermal conductivity shall not exceed 0.23 at 75°F. Manufacturers shall be Certainteed, Knauf, Owens Corning, or Schuller (Manville).
2. Insulation finish shall be factory applied all service jacket with pressure sensitive adhesive closures for the longitudinal and butt joints. Jacket permeance shall not exceed 0.02 perms.
3. All valves, thermometer wells, gauge cocks, hose bibbs, air vent piping, and any other components shall be insulated with molded insulation fittings or same thickness elastomeric insulating tape finished with flexible glass cloth and mastic.
   Provide PVC jacket on insulation where piping is exposed to building occupants. Protective jacket shall be paintable white PVC, high impact type, UV resistant, flame spread and smoke developed 25/50 rated per ASTM E 84 and shall have minimum 0.020” thickness.

PART 3 – EXECUTION

3.01 GENERAL APPLICATION

A. The following general conditions apply to the insulation installation.

1. Insulation shall be clean and dry during installation and during application of any finish.
2. Provide removable and replaceable covers on all pumps and equipment requiring insulation that must be opened periodically for inspection, cleaning, or repair.
3. Install insulation, jackets, and coatings continuous through wall and floor openings and sleeves. See Section 22 05 00 regarding fire barrier sealing over insulated pipes passing through rated floors and walls.

4. Banding wires shall have the twisted terminals turned down into the insulation, except where vapor barrier would be punctured.
5. Finish open ends of pipe insulation as specified for fittings.
6. All piping and equipment that are scheduled to be insulated shall have a finished jacket, either factory or field applied.
7. Staples shall be installed only on insulation that does not contain a vapor barrier.
8. For all cold piping systems (waste piping receiving condensate discharge and domestic cold water), all components of the piping system shall be insulated and provided with a continuous vapor barrier. Vapor barriers shall be continuous for entire piping system and shall not be pierced except as specified otherwise.
9. Factory applied jacket shall be the finish jacket unless otherwise noted.
10. Maintain vapor barrier where dissimilar insulation products abut.

3.02 PIPE SHIELDS

A. For all piping, insulation shall be continuous on pipe at pipe hangers with protection shields bearing on the outside of the insulation.

3.03 INSULATION APPLICATION

A. Type P3 – Glass Fiber Insulation:

1. Cover pipe with insulation with each section tightly abutted one to another. Jacket shall be lapped and secured with self-adhesive strip.
2. Abutting ends of insulation shall be covered with 4" wide butt strips smoothly secured with adhesive.
3. Fittings and valves shall be covered with mitered or molded insulation sections secured with galvanized steel wire and finished with smooth coat of white glass fabric and mastic.

3.04 FINISH JACKETS

A. Pre-sized glass cloth jackets shall be secured by a continuous coating of adhesive applied to a uniform thickness. Jacket shall be smooth without wrinkles. Jacket shall be applied to straight lengths of covering only.

B. Flexible glass cloth shall be applied to equipment, valves, fittings, and curved surfaces. Cloth tape shall be smoothly applied and secured with a continuous coat of adhesive. White fabric and mastic to be used on exposed pipe fittings. Tape shall overlap itself and adjacent jackets not less than two inches (2").

END OF SECTION 22 07 00

SECTION 22 10 00
PIPE, FITTINGS AND ACCESSORIES – PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Piping specified in this Section is for types of pipe and accessories used in Division 22.

1.02 RELATED SECTIONS

A. Division 22 Section “Common Work Results for Plumbing”

B. Division 22 Section “Plumbing Piping and Drainage Accessories”

1.03 QUALITY ASSURANCE

A. Codes and regulations referred to are minimum standards. Where the requirements of these Specifications or Drawings exceed those of the codes and regulations, the Drawings and Specifications govern.

B. Pressure/temperature ratings of all components and accessories shall meet or exceed design conditions for the system in which they are installed.

Welding shall be in accordance with procedures of the National Certified Pipe Welding Bureau and shall comply with the requirements of the ANSI Code for Pressure Piping. Welders shall be qualified under the above procedures and certified by the National Certified Pipe Welding Bureau.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

A. Steel Piping:

1. Pipe (up to 12” diameter):

Material	Specification
Schedule 40 Black steel	ASTM A53-97b Grade B

2. Fittings:

a. 150 lb. SWP malleable iron screwed fittings conforming to ANSI B16.3.
b. 125 lb. SWP cast iron flange fittings conforming to ANSI B16.1.
c. Standard weight factory fabricated butt welding fittings conforming to ANSI B16.9 and ASTM A-234.
d. 150 lb. forged steel welding neck or flat face slip-on flanges conforming to ASTM A181.
e. Socket fittings conforming to ANSI B16.11.
f. Cast iron drainage pattern fittings conforming to ANSI B16.12.
g. Dielectric couplings and/or flange kits shall be provided at connections between ferrous and non-ferrous pipe. Provide with high temperature gaskets rated for 300°F steam service.
h. Unions:

1) Except where otherwise specified, unions in welded piping shall be flanges.
2) Unions in piping 2-inch and smaller shall be 150 lb. malleable iron, ground joint, bronze to iron, screw type.
3) Unions in screwed piping 2½" and larger shall be 125 lb. cast iron flanges.

i. Fittings, flanges and unions in galvanized steel pipe shall be galvanized.

3. Joints, unless specified otherwise:

a. Screwed Joints: Joint compound shall be "Titeseal" or Teflon Tape, except where otherwise specified.
b. Flanged joints shall be made up with 1/16" thick, ring type, compressed composition sheet gasket, except for gas piping which shall be made up with aluminum "O" ring type gaskets. Flange bolts shall be steel hexagon head type, conforming to ASTM Specification A-307. Nuts shall conform to ASTM Specification A-193.

B. Copper Piping:

1. Pipe:

Material	Specification
Type L tube	ASTM B88, latest edition
Type K tube	ASTM B88, latest edition

2. Fittings:

a. Wrought copper solder joint type conforming to ANSI B16.22. Cast fittings conforming to ANSI B16.18, except where otherwise specified, may be used only in patterns not available in wrought fittings, and where desired changes in direction and/or reduction in size cannot be accomplished with two wrought fittings.
b. Adapter fittings shall be provided at all copper to brass pipe connections. Adapters 2" and smaller shall be cast bronze or wrought copper. Adapters larger than 2" shall be 150 lb. cast bronze flanges. Adapters between the meter and the pressure reducing valve shall be 250 lb cast bronze flanges.
c. 150 lb. cast bronze flange fittings conforming to ANSI B16.24 downstream of the pressure reducing valves.
d. Dielectric couplings and/or flanged kits shall be provided at all copper to steel pipe connections.
e. Cast DWV fittings shall conform to ANSI B16.23; wrought DWV fittings to ANSI B16.29.
f. Unions:

1) Except where otherwise specified, unions shall be wrought copper or cast bronze.
2) Unions in piping 2½" and larger shall be 150 lb. cast bronze flanges, downstream of the pressure reducing valve and 250 lb between the meter and the PRV.
3) Insulating unions shall be provided at all equipment having ferrous connections.

3. Copper pipe shall be manufactured by Mueller Industries, Cerro Flow Industries or Cambridge-Lee Industries.
4. Fittings shall be manufactured by Mueller Industries, Cello Products, Nibco or Elkhart Products
5. Joints, unless specified otherwise:

a. Solder Joints: Solder shall be 95/5 (95% tin, 5% antimony) except where otherwise specified. Where specified or noted on the Drawings, solder shall have a silver alloy solder having a melting point of not less than 1100°F. NO LEAD SOLDER SHALL BE PERMITTED.

b. Solder flux shall be the type recommended by the manufacturer of the 95/5 solder used, meeting ANSI/NSF Standard 61. Silver brazing flux shall be used for solder of 1100°F. or higher melting point.

C. Cast Iron Soil Piping:

1. Pipe and Fittings:

a. Coated hub and spigot cast iron soil pipe and fittings conforming to ASTM A74, latest edition with preformed rubber gasket joints conforming to ASTM C564-97.
b. Coated "no hub" cast iron soil pipe and fittings, 10" size and under, conforming to Cast Iron Soil Pipe Institute Standard 301 and ASTM A 888, latest edition.
c. Cast iron P-traps exposed shall have brass cleanout plugs.
d. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
e. Pipe and fittings shall be manufactured by Charlotte Pipe and Foundry, Tyler Pipe or AB&I Foundry.

2. Joints:

a. Compression joints shall consist of a one piece elastomer gasket conforming to ASTM C564.
b. "No hub" vent piping and waste piping 2" and smaller shall be joined with standard stainless steel no-hub couplings as manufactured by MG Coupling Company or equivalent.
c. Heavy duty no-hub couplings shall be used as follows:
d. All rainwater piping.
e. All soil and waste piping larger than 2".
f. Heavy duty no-hub couplings shall be made with Anaheim Foundry Company's Husky SD4000 or Clamp All 125.
g. All couplings shall consist of housing, band, screws, stainless steel shield, and ASTM C564 neoprene gasket.

D. Plastic DWV Piping:

1. Pipe: Solid wall, Schedule 40 PVC and ABS conforming to ASTM D2665 and D2661 respectively.
2. Fittings: Drainage, waste, and vent PVC and ABS fittings conforming to ASTM D2665 and ASTM D2661 respectively.
3. Pipe and fittings shall be manufactured by Charlotte Pipe & Foundry Company or North American Pipe Corporation.
4. Solvent Weld Joints: Primer shall be low VOC (less than 450 PPM) type, tinted purple and conforming to ASTM F-656. Cement shall be industrial grade low VOC type, compatible with the piping material being joined and suitable for temperatures up to 140°F.

2.02 SLEEVES

A. Provide standard weight steel pipe sleeves at all points where piping passes through walls, floors and ceilings, except where otherwise specified.

B. #20 U.S. gauge galvanized steel sleeves may be used through all walls and through floors in concealed pipe chases where concrete thickness is 4" or less.

PART 3 – EXECUTION

3.01 PIPING - GENERAL

A. All piping shall be run straight and parallel to building construction. All changes in directions shall be made with fittings as specified herein and shown on the Drawings.

B. All piping shall be installed with allowance for expansion and contraction. Anchors and guides shall be provided where shown on the Drawings. Swing joints shall be provided at top and bottom and risers and in branch connection at each floor.

C. Pipe connections to equipment which is supported independent of the pipe, including pumps, shall be aligned with the equipment.

D. Buried piping outside the building shall be buried a minimum of 24-inches deep.

E. Install piping so as to preserve access to all valves, air vents, and other equipment and to provide the maximum headroom possible.

F. All piping, except cast iron, which runs through concrete slabs or walls shall be insulated or caulked in sleeves as hereinafter specified so that the pipe metal does not come in contact with the concrete masonry.

G. Equipment Drains, Drips, etc.:

1. All devices and equipment having drain, drip or blowdown connection shall be piped to nearest floor drain terminating with an elbow over grate, except where otherwise specified.
2. Piping shall be run parallel and plumb to walls and shall be braced to walls, floor, other piping or equipment.
3. Piping shall be full size of device or equipment connection. Except for relief valve discharges, horizontal drains may be combined into one pipe that is one pipe larger than largest connecting pipe.
4. Condensate drains shall be trapped and provided with unions and cleanouts.

H. Unions shall be provided at all connections to flow control valves, equipment and apparatus.

3.02 PROCEDURES FOR PIPE JOINTS

A. Welded Joints:

1. All welding of pipe shall conform to the ASME and ANSI Standards B31.1 Power Piping and B31.9 Building Services Piping.
2. Mitering or notching pipe to form elbows and tees will not be permitted. Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of slag, scale and oxidation prior to welding.
3. Before welding, the component parts to be welded shall be aligned so no strain is placed on the weld when finally positioned. Height shall be aligned so that no part of the pipe wall is offset by more than 20 percent of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operations. Connections larger than 6" shall be made with backing rings at welds.

4. Where the temperature of the component parts being welded reaches 32°F or lower, the material shall be heated to approximately 100°F for a distance of 3' on each side of the weld before welding, and the weld shall be finished before the material cools to 32°F. All welds shall be full penetration welds.
5. Defective welds shall be removed and replaced at no additional cost to the Owner. Repairing of defective welds by adding new materials over the defects or by peening will not be permitted.
6. Electrodes shall be stored in a dry, heated area and shall be kept free of moisture or dampness during fabrication operations. Electrodes that have lost part of their flux shall be discarded.
7. Fire protection safeguards shall be employed in connection with welding operations.
8. No welding will be permitted where communication equipment has been installed.
9. Before any welder shall perform any pipe welding, submit a copy of the Welding Operator Qualification Test as required by the referenced standards cited hereinbefore.

B. Screwed Joints:

1. All threads shall be standard, clean cut and tapered. All burrs shall be reamed from inside of the pipe and pipe shall be turned on end and all loose dirt and scale knocked out.
2. Pipes with threads stripped, chipped or damaged, or split pipe or defective fittings shall not be used.
3. Joint compound shall be applied to the male threads only.

C. Copper Tubing Solder Joints:

1. Ends of pipe shall be cut square and cleaned with sand cloth so as to remove all oxides before soldering. Fittings shall be similarly cleaned with sand cloth or wire brush.
2. Flux shall be evenly applied to both pipe end and fittings.
3. Solder shall completely fill all parts of joint. Clean excess flux from pipe after joint completed.

D. Cast Iron Soil Pipe and Ductile Iron Waste Pipe Joints:

1. Compression joints shall consist of one piece elastomer gasket conforming to ASTM C-564.
2. Hubless and Gasketed Joints shall be made up in strict accordance with manufacturer's recommendations.

E. Plastic Pipe Joints:

1. Ends of pipe shall be cut square, cleaned and deburred prior to threading or applying primer.
2. Pipe threading shall be performed per manufacturer’s recommendations.
3. Chemical welded joints shall be primed, cemented and assembled per manufacturer’s recommendations.

3.03 SLEEVES

A. Provide all sleeves in floors, beams, walls, roof, etc., as required for installing work of this Division unless otherwise specified hereinafter.

1. Where exposed in rooms, sleeves in floor slabs, except those on grade, shall project ¼" to 3/8" above finished floor.
2. Sleeves shall be of sufficient size for pipe and full size insulation to pass through.
3. Sleeves through outside walls above grade shall be caulked watertight between pipe or pipe insulation and sleeve with lead and oakum.
4. Sleeves through poured concrete shall be secured to the forms before concrete is poured.
5. Piping passing under or through wall footings, foundations and retaining walls shall be provided with a relieving arc, or an iron pipe sleeve two pipe sizes greater than the pipe passing through.

6. Sleeves shall be spaced sufficient distance from adjacent walls and other sleeves so that insulation and/or finish plates may be installed without cutting insulation or plates.
7. Sleeves shall be placed on the piping as it is installed to permit installation of sleeves in walls, partitions, and slabs in one piece.
8. Omit sleeves where cast iron pipes pass through masonry partitions, slabs on grade, and where all pipes pass through gypsum board partitions.
9. See Specification Section 22 05 00 Common Work Results for Plumbing regarding firestop requirements.

3.04 PRESSURE TESTING

A. See particular piping section for pressure testing requirements.

END OF SECTION 22 10 00

SECTION 22 10 05
PLUMBING PIPING AND DRAINAGE ACCESSORIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the types of piping and accessories for the domestic water service and plumbing system.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Operation and Maintenance of Plumbing”

C. Division 22 Section “Common Work Results for Plumbing”

D. Division 22 Section “Plumbing Valves and Strainers”

E. Division 22 Section “Identification for Plumbing Piping and Equipment”

F. Division 22 Section “Plumbing Systems Insulation”

G. Division 22 Section “Pipe, Fittings and Accessories – General”

H. Division 22 Section “Plumbing Fixtures and Trim”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide product data for all manufactured assemblies; including component dimensions, pipe connection sizes, and pressure drop vs. flow (if applicable).

C. Provide manufacturer’s instructions, indicate installation and support requirements.

D. Provide operation and maintenance data; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. All drains shall be by the same manufacturer.

PART 2 – PRODUCTS

2.01 INTERIOR DOMESTIC WATER SYSTEM TO 5FT OUTSIDE BUILDING

A. Pipe:

1. Type "L" hard copper above ground.
2. Type "K" hard copper buried.

B. Fittings: Wrought copper solder type pressure fittings.

C. Joints: Solder joints 95/5 above ground. Silver alloy solder for buried piping.

D. Flux: Meeting requirements of ANSI/NSF Standard 61.

2.02 SOIL, WASTE AND VENT SYSTEM

A. Pipe and Fittings inside the building to 5'-0" beyond building wall:

1. Cast iron service weight piping. Underground piping shall be hub and spigot with gasketed push-on type joints. Above ground piping shall be no-hub with stainless steel and neoprene couplings.
2. All pipe, fittings, gaskets and couplings shall be of one manufacturer and shall conform to the ASTM requirements listed by the Cast Iron Soil Pipe Institute. Pipe and fittings shall be manufactured by Charlotte Pipe and Foundry, Tyler Pipe or AB&I Foundry.
3. Protective Coating - Cast Iron Inside Soil, Waste and Vent Piping: Piping shall be coated with coal tar enamel or other material that will not burn through when painted.

B. Waste Piping from Fixtures:

1. Connect fixture traps from lavatories, drinking fountains, service sinks, kitchen equipment, etc. to cast iron pipe with DWV copper.
2. Connect fixture traps from urinals to cast iron pipe with Schedule 40 PVC pipe.

C. Flashing: Vents at roof shall be flashed with 3 lb./sq. ft. sheet lead, counter flashed into vent cap collar. Flashings shall extend a minimum of 18" in all directions from the outside perimeter of vent piping.

2.03 GAS PIPING ABOVE GRADE

A. Gas piping shall be schedule 40 black steel pipe.

B. Fittings shall be threaded malleable iron in sizes 2" and under.

C. All gas piping larger than 2” size and all gas piping located in return air plenum shall be welded.

2.04 GAS PIPING BELOW GRADE

A. Piping shall be medium density polyethylene meeting ASTM D-2513.

B. The piping shall be continuous tubing in sizes 3/4” thru 2” and shall be pipe sections in sizes 3” thru 6” I.P.S. Piping shall be jointed with socket fusion fittings.

C. The piping and tubing shall be specifically designed for underground natural gas piping systems with standard dimension ratios and specified wall thickness to meet design pressures of 80 psig at 73°F.

D. The system shall be complete with non-corrosive mechanical non-pull out type couplings, steel to polyethylene non-pull out “O” ring protected transition fittings, and single seal anodeless gas risers.

E. Piping system shall be Performance Pipe DRISCOPLEX 6500 PE2406 polyethylene piping.

2.05 GAS PIPING BELOW SLAB

A. When gas piping runs below slab, provide polyethylene sleeved, flexible steel corrugated gas piping.

B. Stainless steel tubing shall be made from 300 series stainless steel strip conforming to ASTM A240. Tubing shall be suitable for operation with Natural Gas and LP Gas (Propane). Tubing shall be rated for 5 psig pressure.

C. Protective sleeve shall be fire-retarded polyethylene and shall have ASTM E-84 flame spread rating not to exceed 25 and smoke density rating not to exceed 50. Polyethylene shall be resistant to UV. Protective sleeve shall be designed to withstand the superimposed loads. The sleeve shall have internal vent channels lengthwise to direct any leakage along the pipe to the end fittings. End fitting shall consist of AutoFlare fittings with a plastic containment coupling and ¼" NPT vent port to provide venting. ¼" diameter type K copper piping shall be connected to vent port on fitting, extend and terminate to outdoors.

D. No fittings are permitted under the slab of a building.

E. Piping system shall be TracPipe PS-II by Omega Flex.

2.06 COMPRESSED AIR PIPING

A. Piping Materials:

1. Concealed piping smaller than ½" shall be seamless copper tubing, ASTM B88-1983a, Type K or L, soft annealed, with braze joint fittings.
2. Exposed piping, and concealed piping ½" and larger shall be seamless copper tubing, ASTM B88-1983a, Type K or L, hard drawn, with braze joint fittings.
3. Fittings shall be wrought copper, brass, or bronze designed for brazed connections.
4. Pipe and fitting sizes for copper tubing are nominal inside diameter.

B. Brazing Alloys:

1. Copper-to-Copper Joints: ANSI/AWS A5.8-1981, Classification Cup-5, 14% silver brazing alloy with a melting point range of 1300F. to 1500F.
2. Dissimilar Metal Joints: ANSI/AWS A5.8-1981, Classification BAg-1, 45% silver brazing alloy with melting point range of 1145F. to 1400F.
3. Flux: Approved by brazing alloy manufacturer.
4. Manufacturer shall be Airco, Handy & Harman, or Harris.

2.07 CLEANOUTS

A. Cleanouts outside the building shall extend up to grade (in 12" x 12" x 6" concrete pad) with countersunk cleanout caps set flush with finished grade. They shall consist of a cast iron trap screw ferrule, and heavy brass or bronze plug with countersunk head; Smith 4400.

B. Cleanouts for concealed piping in floor or ceiling construction shall extend through the finished floor above. Medium duty cleanouts shall be cast iron body, adjustable housing, round top, bronze plug, solid satin nikaloy secured top; Smith 4026. Cleanouts in carpeted areas shall have carpet markers.

C. Heavy duty cleanouts subject to vehicular traffic shall be cast iron adjustable body, round solid satin nikaloy top, secured top, bronze plug; Smith 4246-M-U. Where waterproofing membranes are provided, cleanouts shall have a flashing clamping device.

D. Cleanouts for piping concealed in wall construction shall be tapped for machine screws and provided with access cover plates, Smith 4472T stainless steel.

E. Equal products by Josam or Zurn are acceptable.

2.08 FLOOR DRAINS AND DECK DRAINS

A. FD1 (Bathrooms). Cast iron body, flashing collar, bottom outlet, adjustable height strainer, trap primer connection, 6" round secured polished nickel bronze strainer, J.R. Smith 2010(C)06-P050. Provide flashing collar where installed in waterproof membranes.

B. FD2 (Mechanical Rooms). Cast iron, flashing collar, adjustable top, bottom outlet, medium duty, sediment bucket, weep holes, 8" strainer, with trap primer connection; J.R. Smith 2350-P050. Provide flashing collar where installed in waterproof membranes.

C. FS (Floor Sink): Cast iron flanged receptor with acid resistant coated interior, nickel bronze rim, secured grate, grate type as indicated on kitchen consultant drawings, sediment bucket, 12-1/2” square top, 3/4 grate, 6” deep; J.R. Smith 3141. Provide flashing collar where installed in waterproof membranes.

D. Trench Drain (Apparatus Bay): Trench drain surface drainage system shall be ACO Drain PowerDrain S100K complete with slotted gratings secured with ‘PowerLok’ locking as manufactured by ACO Polymer Products, Inc. or equal approved. The trench system bodies shall be manufactured from polyester polymer concrete with minimum properties as follows; Compressive strength: 14,000 psi, Flexural strength: 4,000 psi, Water absorption 0.07%, Frost proof, Salt proof, Dilute acid and alkali resistant. The nominal clear opening shall be 4” with overall width of 6.30”. Pre-cast units shall be manufactured with either an invert slope of 0.5% or with neutral invert and have a wall thickness of at least 0.67” (16mm). Each unit will feature a partial radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring keys on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. The ductile iron edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 1/4” thick. Grates are manufactured from slotted ductile iron. Ductile iron to ASTM 536-84 - Grade 65-45-12. After removal of grates there shall be uninterrupted access to the trench to aid maintenance. Water intake area per meter channel unit shall be 46 in2.

E. Equal drains by J.R. Smith, Josam or Zurn are acceptable.

2.09 WATER HAMMER ARRESTERS

A. Water arrester shall be permanently charged and sealed. Manufacturers shall be American Tube and Controls "Hammertrol", Zurn "Shok-Trol", Wade "Shock-Stop", Josam "Absorbotron", or Jay R. Smith "Hydrotrol". Size of arresters is determined by the Plumbing and Drainage Institute's symbols set forth in Standard PDI-WH-201.

2.10 HYDRANTS

A. HB: Hose Bibbs shall be furnished with integral vacuum breaker, 3/4" hose thread, removable handle, polished chrome finish; Chicago 952.

B. WH: Non-Freeze wall hydrant shall be cast bronze non-freeze wall hydrant with polished face, integral vacuum breaker, backflow preventer, hinged and latched cover marked "Water", Smith 5509 Series.

C. WH1: All bronze warm climate wall hydrant in stainless steel box with chrome plated face, hose connection with ASSE 1011 integral vacuum breaker, 360 degree swivel inlet connection, “T” handle key; Smith 5518 Series.

D. RH: Non-freeze roof hydrant shall include type 304 stainless steel shroud w/ welded stainless steel flange and R-8 rated / thermo-cell insulation, black powder coated cast aluminum weather-guard dome handle, 125 lb.-1” bronze globe angle valve with vacuum breaker, stainless steel reservoir, under-deck support flange w/ hardware. Unit shall be self contained for freeze protection and shall not require a drain connection for freeze protection; Mapa Products model MPH-24FP or equal by Prier or Woodford.

E. Hydrants by Josam, Zurn or Woodford are acceptable.

2.11 TRAP GUARD

A. P-Trap Barrier insert: An elastomeric normally closed membrane, trap guard device to utilize a normally closed p-trap seal; SureSeal Trap Sealer.

2.12 REFRIGERATOR VALVE BOX

A. Oatey ice maker valve box Model 38570, high impact polystyrene with 1/4 turn brass hammer ball valve and copper sweat connection with 6 feet stainless steel hose.

2.13 WASHER BOX

A. Oatey center drain washing machine outlet box Model 38748 with 1/4 turn brass hammer ball valves and CPVC sweat connection.

2.14 LINT INTERCEPTORS

A. Lint Interceptors shall be fabricated steel with gray Duco coating, capacity as noted on plans, stainless steel primary and secondary lint screens with secured gasketed diamond plate cover, anchor flange and extension to finished floor; J.R. Smith 8910 series. Equal products by Watts, Josam, Mifab or Zurn are acceptable.

2.15 HR

A. Hose Reel shall be Coxreels truck series maximum duty air hose reel with 3/8in.x 100 ft PVC hose, max. 300 psi, Model TSH-N-3100.

PART 3 – EXECUTION

3.01 PIPING GENERAL

A. Temporary Closures: During construction period all rough-in plumbing shall be sealed off with test plugs and caps until fixtures are ready to be installed.

3.02 DOMESTIC WATER

A. Drains from backflow preventers, air gap devices and strainers shall be piped to floor drains.

3.03 SOIL, WASTE, VENT AND RAINWATER

A. Grading: Horizontal drainage piping 2" and smaller shall be graded not less than ¼" per foot, piping 3" and larger shall be graded not less than 1/8" per foot. Vents shall be graded so as to drain back to the soil or waste pipe. Sewer piping shall be graded in accordance with inverts established on the drawings. For all drainage piping, the slope shall be uniform for the entire length.

B. Hub drains at slab level shall be continuation of hub and spigot piping system. No-hub piping shall be used above slab level with exception of hub drains at slab.

3.04 DRAINS

A. All drains shall be set and secured in place before concrete is poured.

B. Clamping devices shall be provided where waterproofing membrane is used.

C. Drain deck clamps shall be provided on metal deck and other similar structure.

D. Set floor drains and floor cleanouts level with finished floor.

3.05 CLEANOUTS

A. Provide cleanouts where shown on drawings.

B. Size of cleanouts shall be of the same nominal size as the pipe served for pipe sizes four inches and smaller; for larger pipe sizes, cleanouts shall be not less than 4" nominal pipe size.

C. Extend cleanout ferrule and plug to within 1" minimum of finished wall, ensuring that all cleanouts shall be accessible.

D. Cleanouts exterior to the building shall be enclosed in a 12" x 12" x 6" formed concrete pad flush with grade.

3.06 DRAIN AND CLEANOUT JOINTS

A. Joints between pipe and inside caulk bodies may be made with Jiffee-Joint Gaskets conforming to ASTM C-564.

B. Gaskets shall be selected for the specific pipe specified.

C. Gaskets shall be of the same manufacturer as the drains or cleanouts.

3.07 TRAPS

A. Provide traps for all fixtures and floor drains, except rainwater drains. Set traps true and level. Provide exposed traps with brass cleaning screws.

3.08 WATER HAMMER ARRESTERS

A. Install at locations shown on the Plans.

3.09 TRAP PRIMERS

A. Trap primers shall be located as shown on the plans.

B. Trap primers serving multiple traps shall be located in an accessible location and shall serve a maximum of eight (8) drains.

C. Supply piping to trap primers shall be taken off the top of the main to prevent entry of foreign material.

3.10 GAS PIPING TRACER

A. Install an insulated eight (8) gauge galvanized steel wire and yellow vinyl tape marked “GAS” in the same trench just above the piping. Steel wire and tape shall be continuous for the entire underground run of piping.

3.11 PRESSURE TESTS

A. All piping shall be pressure tested before insulation and concealment.

B. The following piping shall be tested to the pressure and for the period of time listed, and shall hold the specified pressure at the low point of the system for the specified length of time, without perceptible loss of pressure or leakage.

C. At the completion of the tests, the Contractor shall submit a letter on his letterhead certifying that the tests have been performed and listing the date of the tests.

1. Domestic Water Piping:

    a. Water service from meter to pressure reducing valve and all other water piping subject to local authority pressure shall be hydrostatically tested at 225 psi for two (2) hours.
    b. Water piping downstream of the pressure reducing valve shall be hydrostatically tested at 125 psi for two (2) hours.

2. Soil, Waste, Vent, and Drainage Piping:

a. A water test shall be applied to the system in sections. Each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be tested with not less than 10 feet head of water. In testing successive sections, at least the upper 10 feet of the preceding section shall be retested so that all but uppermost 10 feet of the system shall have been submitted to a test of not less than 10 feet of water.

b. The water level shall remain constant for not less than 15 minutes; the system shall be tight at all points.

3. Gas piping shall be air tested to 30 psig for two (2) hours without loss of pressure. Underground piping shall be tested prior to covering pipe. If piping does not hold pressure, then soap test and repair joints. Re-test piping to specified period until test holds.

3.12 PIPE FLUSHING AND STERILIZING

A. All potable water piping installed inside the building beginning at the building service entry and extending to all water outlets shall be flushed and sterilized as follows:

1. After the potable water piping systems have been installed, pressure tested, and all plumbing fixtures have been set, the piping shall be sterilized by the addition of chlorinating material. The chlorinating material shall be either liquid chlorine conforming to Federal Specification BB-C-120 or hypochlorite conforming to Federal Specification O-C-114, or Federal Specification O-S-602, Grade A or B.
2. Chlorinating material shall be added in a metered fashion to provide a dosage of not less than 50 parts per million. The chlorinating solution shall remain in the entire piping system for a period of not less than six hours. At the end of the test, a retention of at least 10 parts per million of chlorine shall exist or the test shall be repeated. During the test all valves in the system shall be opened and closed several times.
3. After the test is completed and satisfactory results obtained, the system shall be drained and flushed to remove the chlorinated solution. The system shall be satisfactorily flushed when the residual chlorine is reduced to 2 parts per million.
4. At the completion of the test, the Contractor shall submit a letter on his letterhead certifying that the test has been performed and listing the date of the test and the chlorine levels at the beginning and end of the test, and at each stage identified herein.

3.13 VIDEO INSPECTION

A. Video inspection shall be performed on all concealed sanitary sewer, waste, vent and rainwater lines. Inspection shall be performed before piping is covered. Provide copy of video for the Owner.

END OF SECTION 22 10 05

SECTION 22 11 25
PLUMBING PUMPS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the pumps and their motors required for the plumbing systems.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Operation and Maintenance of Plumbing”

C. Division 22 Section “Common Work Results for Plumbing”

D. Division 22 Section “Identification for Plumbing Piping and Equipment”

E. Division 22 Section “Plumbing Insulation”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide product data showing pump curve with system operating point, motor horsepower, electrical requirements and RPM.

C. Provide Shop Drawings showing pump dimensions and pipe connection size and accessories.

D. Provide manufacturer’s instructions, indicate installation and support requirements.

E. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

PART 2 – PRODUCTS

2.01 HOT WATER CIRCULATING PUMPS

A. Centrifugal single stage, in-line pump shall be horizontal, permanently lubricated, designed for quiet operation, and rated for 125 psi working pressure. Pump shall include stainless steel neck rings and impeller, corrosion resistant surface treatment, shell coupling, top pull out principle for easy maintenance, opposite suction and discharge ports enabling mounting in pipe work or on a foundation, and corrosion resistant maintenance free mechanical shaft seal. Motor shall be totally enclosed, fan cooled, two pole standard motor with main dimensions to NEMA standards and shall be non-overloading at any point on pump curve. Motors shall have built-in thermal overload protectors. The starter shall be equipped with manual reset buttons. Pump shall include all bronze pump housing.

B. Pump capacity shall be as scheduled on the Drawings.

C. Pump shall be Armstrong, Bell & Gossett, or Grundfos.

PART 3 – EXECUTION

3.01 HOT WATER CIRCULATING PUMPS

A. Circulating pumps shall be supported from the structure by threaded rod and pipe hangers.

B. Test the pump for proper power wiring relating to rotation prior to installing the pump.

3.02 STARTUP

A. The initial start-up of all pumps shall be performed by a qualified factory representative of the pump manufacturer. The factory representative shall supervise the start-up and instruct Owner's personnel in the proper operation and maintenance of the pumps. Each pump system manufacturer shall provide a minimum of 1 hour of Owner training for each pump system at completion of equipment start-up.

B. Start-up report shall be submitted in triplicate indicating all operational controls tested and performance documented.

END OF SECTION 22 11 25

SECTION 22 34 00
DOMESTIC WATER HEATING EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the domestic water heating equipment.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Operation and Maintenance of Plumbing”

C. Division 22 Section “Common Work Results for Plumbing”

D. Division 22 Section “Plumbing Valves and Strainers”

E. Division 22 Section “Seismic Restraints Mechanical”

F. Division 22 Section “Identification for Plumbing Piping and Equipment”

G. Division 22 Section “Plumbing Systems Insulation”

H. Division 22 Section “Pipe, Fittings and Accessories – Plumbing”

I. Division 22 Section “Pumps – Plumbing”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide shop Drawing showing water heater dimensions, capacities, weight, pressure rating, electrical requirements and pipe connection sizes and locations.

C. Provide shop Drawings for control panel showing the proposed wiring diagram with accompanying complete typewritten sequence of operations (if applicable). A symbols list defining all abbreviated components shall be included. A cut sheet on each component used in the system shall be included. The diagram shall delineate between power and control wiring and shall indicate all contactors, relays, and other components of the system. Normally open positions for the relays shall be indicated.

D. Provide manufacturers recommendations for flue vent configuration and flue material (if applicable).

E. Provide manufacturer’s instructions, indicate installation and support requirements.

F. Provide manufacturer’s certificate indicating that the unit’s construction meets or exceeds the seismic force requirements as specified in Specification Section 22 05 48 – Vibration and Seismic Controls for Plumbing.

G. Provide operation and maintenance data; include start-up instructions, assembly drawings and parts list.

PART 2 – PRODUCTS

2.01 HIGH EFFICIENCY CONDENSING GAS WATER HEATERS

A. Natural gas, vertical storage tank type, CSA certified hot water heater with minimum thermal efficiency of 94%.

B. Water heater shall be high efficiency type with power burner with direct vent sealed combustion. Combustion venting to be PVC. Heater shall be vented as noted on Drawings with factory recommended screen and weatherproof enclosure over vents at exterior.

C. The tank shall be of glass-lined steel and rated for 150 psi. The heater shall be complete with automatic thermostat, foam insulation and steel jacket with baked enamel finish and cold water connection in lower part of tank. Controls shall include low water cutoff and high temperature protection. Controls shall be provided to meet ASME Safety Code CSD-1, latest version, as a minimum.

D. Water heater shall exceed ASHRAE 90.1-2004 Performance Requirements:

≤75,000 BTUH and ≥20 gal, Min Energy Factor = 0.62-0.0019V where
V = Rated Vol. (gals)
>75,000 BTUH and <4,000 BTUH/Gal, Min Thermal Efficiency = 80%

E. Storage tank shall be warranted for three (3) years against corrosion failure.

F. Heater shall be provided with CSA/ASME rated temperature and pressure relief valve. Relief valve shall be set to relieve at 210°F or 125 psig.

G. Capacity shall be as scheduled on the Drawings.

H. Water heaters shall be Rheem or equal by A.O. Smith, Bradford White, Rheem or Lochinvar.

2.02 THERMAL EXPANSION TANKS

A. Expansion tanks shall be pre-charged to 40 psi (adjustable), FDA and NSF approved for use in domestic water systems. Tank shall have working pressure of 150 psig and maximum temperature of 200°F.

B. Tank shall be steel with an epoxy finish and include a FDA approved double butyl rubber diaphragm.

C. The tank shall have a NPT connection of brass or stainless steel and incorporate an air charging valve.

D. Expansion tank shall be Amtrol ST-20VC or equal by Flexcon Industries, Bell & Gossett, or Sparco.

PART 3 – EXECUTION

3.01 DOMESTIC HOT WATER HEATER INSTALLATION

A. Pipe relief valve discharge the full size of relief valve discharge opening in Type "L" copper pipe to over nearest drain as noted on the Drawings. Terminate discharge over drain with indirect connection.

B. Set water heater thermostat controls for 140°F water.

3.02 THERMAL EXPANSION TANK

A. Expansion tank pre-charge shall be adjusted in the field to match the line pressure of the system which they are serving.

B. All floor type expansion tanks shall be secured to the housekeeping pad with clips or brackets so as to not weld on the tank itself.

3.03 STARTUP

A. The initial start-up of all water heater(s) shall be performed by a qualified factory representative of the heater manufacturer. The factory representative shall supervise the start-up and instruct Owner's personnel in the proper operation and maintenance of the heaters.

B. Start-up report shall be submitted in triplicate indicating all operational controls tested and performance documented.

END OF SECTION 22 34 00

SECTION 22 40 00
PLUMBING FIXTURES AND TRIM

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the fixtures and trim requirements.

1.02 RELATED SECTIONS

A. Division 22 Section “General Provisions – Plumbing”

B. Division 22 Section “Operation and Maintenance of Plumbing”

C. Division 22 Section “Common Work Results for Plumbing”

D. Division 22 Section “Plumbing Valves and Strainers”

E. Division 22 Section “Plumbing Insulation”

F. Division 22 Section “Pipe, Fittings and Accessories – Plumbing”

G. Division 22 Section “Plumbing Piping and Drainage Accessories”

H. Division 22 Section “Plumbing Pumps”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide product data for all fixtures; including catalog illustrations, dimensions, pipe connection sizes, and associated trim.

C. Provide manufacturer’s instructions, indicate installation and support requirements.

D. Provide operation and maintenance data; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. All fixtures shall have the manufacturer's guarantee; label or trademark indicating specified quality. All Acid Resisting enamel shall bear the manufacturer's symbol signifying Acid Resisting material.

B. All vitreous china fixtures shall be by the same manufacturer. All sinks shall be by the same manufacturer.

C. All fixtures construction components, tanks, and joints shall be of lead free material and construction.

D. All drinking fountains, lavatory faucets and fixture stops shall meet NSF Standard 61 and NSF372 test standards via third party testing and certification. Lavatory faucets and fixture stops serving potable water fixtures shall be of lead free construction such that the wetted surface shall have a weighted average lead content ≤0.25% per Safe Drinking Water Act.

E. Fixtures shall be white in color and all spaces between the fixture and the wall or floor shall be filled with white, mildew resistant, non-hardening silicone caulking.

PART 2 – PRODUCTS

2.01 FIXTURES

A. Fixture shall be complete with all equipment, fittings, and trim. Fittings and trim shall be chrome plated brass unless specified otherwise, including P-traps, supplies and stops.

2.02 FIXTURE SCHEDULE

A. Fixtures shall be as follows:

1. Vitreous china fixtures shall be manufactured by American Standard, Kohler or Toto.
2. Flush Valves shall be manufactured by Sloan or Toto.
3. Fixture support carriers shall be manufactured by J.R. Smith, Josam or Wade.
4. Toilet seats shall be manufactured by Bemis, Church or Olsonite with Sta-Tite fastening system.
5. Stainless steel sinks shall be manufactured by Advance Tabco, Elkay or Just.
6. Drinking fountains shall be manufactured by Acorn Aqua, Elkay or Oasis.
7. Lavatory and Sink fixture trim shall be manufactured by Chicago, Moen Commercial or T&S Brass.
8. Shower valves shall be Delta.
9. Stops, traps and tailpieces shall be by one manufacturer BrassCraft, Engineered Brass or McGuire.
10. Drain, trap, and supply insulation under ADA fixtures shall be McQuire Prowrap, Plumberex Handy Shield or TruBro LavGuard.

B. Fixtures:

1. WC (Wall Hung Water Closet):

a. Fixture: Wall hung flush valve, vitreous china, elongated siphon jet bowl, top spud, fixture shall operate in the range of 1.1 to 1.6 gallon per flush; American Standard 3351.101.
b. Flush valve: Exposed, manually operated, diaphragm type, chrome plated flushometer, vacuum breaker and screwdriver stop; Sloan 111-1.28.
c. Seat: Commercial plastic elongated seat with open front, less cover, Sta-Tite commercial fastening system, self sustaining concealed check hinge; Church 9500SSCT.
d. Fixture Support: Bolt type floor mounted fixture carrier; J.R. Smith 200 Series.

2. WCH (ADA Wall Hung Water Closets):

   a. Same as WC except different mounting height.

3. L1 (ADA Counter Lavatory):

   a. Fixture 20-7/8" x 14-3/8" x 8-1/8" undermount, vitreous china lavatory, , mounting kit and template; Kohler K-2214.
   b. Faucet: ADA compliant, 4" fixed centers, manual, wrist blade handles, quarter turn faucet with chrome plated spout and 0.5 GPM aerator; Chicago 802-317ABCP. No substitutes.
   c. Drain: 1¼" open grid lavatory strainer, chrome plated, 17-gauge tubular brass tailpiece, brass locknut, heavy rubber basin washer and fiber friction washer; McGuire 155 series.
   d. P-trap: 1-1/4" chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2" water seal; McGuire 8872 series.
   e. Supplies: Provide lead free sweat by compression chrome plated brass angle stop(s) with hand wheel, all brass stem and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF175 series.
   f. Mixing Valve: Provide thermostatic mixing valve meeting ASSE 1070, MV2, at each public lavatory location. Provide supply inlets from wall to mixing valve and tempered water from mixing valve to faucet hot water inlet.
   g. Accessories: Provide waste and supply piping covers on drain, trap and water supplies under lavatory to satisfy ADA compliance requirements in locations where ADA shroud is not provided; TruBro LavGuard 103 E-Z.

4. L2 (ADA Wall Hung Lavatory):

   a. Fixture: 20" x 18" wall hung, vitreous china lavatory, front overflow, single center faucet hole; American Standard 0356.421.
   b. Faucet: ADA compliant, 4" fixed centers, manual, wrist blade handles, quarter turn faucet with chrome plated spout and 0.5 GPM aerator; Chicago 802-317ABCP. No substitutes.
   c. Mixing Valve: Provide ASSE 1070 compliant mixing valve, MV3, below each lavatory. Provide hot and cold water to mixing valve and tempered water from mixing valve to faucet inlet.
   d. Drain: 1¼" offset wheelchair lavatory strainer, chrome plated brass, 17 gauge tubular brass offset tailpiece; McGuire 155WC series.
   e. P-trap: 1-1/4" chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2" water seal; McGuire 8872 series.
   f. Supplies: Provide lead free, sweat by compression chrome plated brass angle stops with hand wheel, all brass stems and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF175 series.
   g. Accessories: provide waste and supply piping covers on drain, trap and water supplies under lavatory to satisfy ADA compliance requirements; TruBro LavGuard 103 E-Z.
   h. Support: Bolt type floor mounted fixture carrier for concealed arm lavatories; J.R. Smith 0700 Series.

5. SHR (Shower):

   a. Fixture: Shower stalls/compartments shall be specified by the Architect.
   b. Drain: Provide 3" type FD1 drain in each shower compartment.
   c. Valve: shower valve shall be chrome plated metal construction, single handle manual pressure balancing valve with universal rough valve brass body with stops, adjustable temperature limit stop, all parts replaceable from the front of the valve; Delta T14293 complete with shower head.

6. SHRH (ADA Shower):

   a. Fixture: Shower stalls/compartments shall be specified by the Architect.
   b. Drain: Provide 3” type FD1 drain in each shower compartment.
   c. Valve & Showerhead: shower valve shall be chrome plated metal construction, universal shower handle, manual pressure balancing valve with universal rough valve brass body with stops, adjustable temperature limit stop, all parts replaceable from the front of the valve; Delta T17TH155-25 complete with hand held shower, stainless steel hose and 36” stainless steel slide/grab bar.

7. S1 (Single Compartment Sink):

   a. Fixture: Single compartment, 18 gauge, under mount, extra deep, type 304 stainless steel sink, 30" x 18" x 12" deep; Just USXD-1830-A. No substitutes.
   b. Faucet: deck mounted, chrome plated metal construction, high arc pull down kitchen faucet, 1.5 GPM aerator, lever handle; Moen Arbor 7594. No substitutes.
   c. Drain: Provide chrome plated brass basket strainer(s) with 17 gauge tailpiece; McGuire 151M.
   d. Provide continuous fee 1/2hp garbage disposer under sink; InsinkErator Badger 5.
   e. P-trap: 1-1/2” chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2” water seal; McGuire 8912 series.
   f. Supplies: Provide lead free, sweat by compression chrome plated brass angle stop(s) with hand wheel, all brass stems and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF177 series.
   g. Accessories: provide waste and supply piping covers on drain, trap and water supplies under lavatory to satisfy ADA compliance requirements; TruBro LavGuard 102 E-Z.

8. S2 (Two Compartment Sink):

   a. Fixture: ADA double compartment, 18 gauge, under mount, type 304 stainless steel sink, 18” x 32” x 5½” deep; Just UD-ADA-1832-A.
   b. Faucet: deck mounted, chrome plated metal construction, high arc pull down kitchen faucet, 1.5 GPM aerator, lever handle; Moen Arbor 7594. No substitutes.
   c. Drain: Provide stainless steel basket strainer with ADA offset, 17 gauge tailpiece; McGuire 1151AWC.
   d. Provide continuous fee 1/2hp garbage disposer under sink; InsinkErator Badger 5.
   e. P-trap: 1-1/2” chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2” water seal; McGuire 8912 series.
   f. Provide 17-gauge chrome plated waste between basket strainers and p-trap.
   g. Supplies: Provide lead free sweat by compression chrome plated brass angle stops with hand wheel, all brass stems and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF177 series.

9. S3 (Hand Wash Sink):

   a. Fixture: ADA single compartment, 16 gauge, ledge type, type 304 stainless steel sink, 21” x 17” x 5½” deep; Just SL-ADA-2117-16.
   b. Faucet: deck mounted, chrome plated metal construction, high arc pull down kitchen faucet, 1.5 GPM aerator, lever handle; Moen Arbor 7594. No substitutes.
   c. Drain: Provide chrome plated brass basket strainer(s) with 17 gauge tailpiece; McGuire 151M.
   d. P-trap: 1-1/2” chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2” water seal; McGuire 8912 series.
   e. Supplies: Provide lead free sweat by compression chrome plated brass angle stops with hand wheel, all brass stems and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF175 series.

f. Mixing Valve: Provide thermostatic mixing valve meeting ASSE 1070, MV2, at each public lavatory location. Provide supply inlets from wall to mixing valve and tempered water from mixing valve to faucet hot water inlet.
g. Accessories: Provide waste and supply piping covers on drain, trap and water supplies under lavatory to satisfy ADA compliance requirements in locations where ADA shroud is not provided; TruBro LavGuard 103 E-Z.

10. LS (Laundry Sink):

a. Fixture: 22" x 23" molded stone, floor mounted laundry tub with baked enamel legs and leveling feet; Fiat FL-1.
b. Faucet: deck type, 4" centers, threaded outlet spout; Moen 8124.
c. Drain: Provide grid strainer and 1½" chrome plated 17 gauge tailpiece.
d. P-trap: 1-1/2" chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2" water seal; McGuire 8912 series.
e. Supplies: Provide lead free, sweat by compression chrome plated brass angle stop(s) with hand wheel, all brass stems and replaceable washers. Provide with flexible chrome plated copper riser(s) and chrome plated steel flange; McGuire LF177 series.

11. SS1 (Square Service Sink):

a. Fixture: 24" x 24" x 12" deep terrazzo mop basin with 6" front drop, stainless steel caps and wall guard; Stern Williams SBC-1700-BP or comparable product by Fiat.
b. Faucet: Chrome plated brass with vacuum breaker spout, hose thread outlet, pail hook, wall support, integral check stops, service stops, lever handles with color indicators, ¼ turn ceramic disc cartridge. Moen 8124 series.
c. Accessories: provide with wall panels, 5' hose and mop hanger.

12. SS2 (Rectangle Service Sink)

a. Fixture: 36" x 24" x 12" deep terrazzo mop basin with 6" front drop, stainless steel caps and wall guard; Stern Williams HL-21000-BP or comparable product by Fiat.
b. Faucet: Chrome plated brass with vacuum breaker spout, hose thread outlet, pail hook, wall support, integral check stops, service stops, lever handles with color indicators, ¼ turn ceramic disc cartridge. Moen 8124 series.
c. Accessories: provide with wall panels, 5' hose and mop hanger.

13. EDFD (Dual Drinking Fountain):

a. Fixture: ADA compliant; self contained, wall mounted bi-level stainless steel, dual, non-filtered drinking fountains. Unit shall have 8.0 GPH of 50°F water at 90°F ambient and 80°F inlet water and 5 year warranty; Elkay ERPBM28RAK. No substitutes.
b. P-trap: 1-1/4" chrome plated cast brass adjustable p-trap with cleanout plug, 17 gauge, minimum 2" water seal; McGuire 8872 series.
c. Provide lead free sweat by compression chrome plated brass angle stop with hand wheel, all brass stem and replaceable washers. Provide with flexible chrome plated copper riser; McGuire LF175 series
d. Fixture Support: Bolt type floor mounted fixture carrier for drinking fountains, J.R. Smith Series 0830.

14. Pot Filler:

a. Faucet: Wall mount pot filler, single hole application, cold water connection only, 4 gpm, washerless ceramic valve, chrome, lead free; Delta 1165 LF.

PART 3 – EXECUTION

3.01 STOP OR GATE VALVES SHALL BE PROVIDED IN HOT AND COLD WATER SUPPLY TO EACH FIXTURE. UNION CONNECTIONS SHALL BE PROVIDED ON FIXTURE SIDE OF STOP OR GATE VALVE AT EACH FIXTURE.

3.02 THE COLD WATER VALVE SHALL BE LOCATED ON THE RIGHT SIDE OF THE FIXTURE FOR BOTH HOT AND COLD OR COLD WATER ONLY SINKS.

3.03 HANDLES FOR ADA WATER CLOSETS SHALL BE MOUNTED ON THE WIDE SIDE OF THE TOILET AREA.

3.04 PROVIDE ALL INTERCONNECTING PIPING AND ASSOCIATED NIPPLES BETWEEN SHOWER VALVES AND HEADS.

3.05 MOUNTING HEIGHTS OF ALL FIXTURES SHALL BE THE DISTANCE FROM FLOOR TO RIM OF FIXTURES AND SHALL CONFORM TO THE MANUFACTURER'S STANDARDS.

3.06 CLEAN AND CAULK ALL FIXTURES IMMEDIATELY PRIOR TO FINAL INSPECTION.

3.07 COORDINATE LOCATIONS OF FIXTURES FOR COUNTERTOP INSTALLATION BEFORE ROUGH-IN OF PIPING.

3.08 CONTRACTOR TO MAKE FINAL CONNECTIONS TO ALL FIXTURES, INCLUDING THOSE FURNISHED UNDER ANOTHER SECTION OR BY THE OWNER.

END OF SECTION 22 40 00

SECTION 23 00 10
GENERAL PROVISIONS – HVAC

PART 1 – GENERAL

1.01 DESCRIPTION

A. These Mechanical General provisions specified herein apply to all Sections of Division 23.

1.02 WORK INCLUDED

A. Provide all materials, labor and services as specified in Division 23 and shown on the Drawings.

1.03 DEFINITIONS

A. Terms: The following definitions of terms are applicable to all Mechanical Sections.

1. Provide: Furnish, install and connect completely.
2. Piping: Pipe installed with all required fittings, valves and accessories, and forming a complete system.
3. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, and accessories completely installed.
4. Power Wiring: Wiring which supplies the electrical current which flows through a connected motor or heater.
5. Exposed: Revealed to view or subject to weather.
6. Control, interlock and starting circuit wiring: All wiring required by all Mechanical Sections that is not power wiring.
7. Fittings: All connecting pieces of a system.

B. Drawings: The Mechanical Drawings are diagrammatic except where specifically indicated otherwise. Refer to Architectural and Structural Drawings for building dimensions.

C. Materials: Refer to the General Conditions. All material shall be suitable for the service and operating conditions of this Specification.

1.04 ABBREVIATIONS

A. The following abbreviations are used in this Division of the Specifications:

AGA	American Gas Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute.
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitation Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual
LEED	Leadership in Energy and Environmental Design
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
NEMA	National Electrical Manufacturers Association

NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
SCS	Soil Conservation Service
UL	Underwriters Laboratories, Inc.
USGBC	United States Green Building Council

1.05 APPLICABLE CODES

A. The latest amended editions of the codes applicable to the work of the municipality having jurisdiction.

B. In the absence of any municipal adopted codes, the following shall apply:

1. International Mechanical Code, 2012 Edition, with Georgia Amendments (2014, 2015)
2. International Fuel Gas Code, 2012 Edition, with Georgia Amendments (2014, 2015)
3. International Energy Conservation Code, 2009 Edition, with Georgia Supplements and Amendments (2011, 2012)
4. All City, County, State, Regional, and other ordinances applicable to the work shall apply.

1.06 RELATED WORK

A. The following work is generally specified in other Divisions of the Specifications, except as specifically otherwise stated in this Division.

1. Electric power wiring.
2. Painting.

1.07 QUALITY ASSURANCE

A. This work requires special construction expertise; the following qualifications will be required.

B. Contracting Experience and Licensing:

1. The Contractor shall have been in business under the present company name for a minimum of five (5) years. An officer, partner or principal of the Contractor shall be the holder of the License.
2. The Contractor shall not have been declared in default on any construction contract within that time.
3. Experience outlined in paragraphs above must be demonstrated by projects which are complete prior to the bid date for this work.

1.08 SPACE CONDITIONS

A. All work shall fit the spaces available. Verify all dimensions of the work before commencing fabrication and/or installation.

B. Minor deviations from the Drawings required to conform to space conditions and to provide the required operation, service, or maintenance accessibility shall be made at no additional cost, and subject to approval.

C. Piping, equipment, or ductwork shall not be installed in electrical equipment rooms. Outside of electrical equipment rooms, do not run piping or ductwork, or locate equipment, with respect to switchboards, panel boards, power panels, motor control centers, or dry type transformers:

Within 42" in front (and rear if free standing) of equipment; or
Within 36" of sides of equipment
Clearances apply vertically from floor to ceiling structures.

D. Hydronic piping shall not be installed above any electrical or control panels.

E. Equipment, appliances, fans or other components that require service shall not be located within 10 feet of a roof edge.

1.09 RECORD DRAWINGS

A. Upon completion of the Project, the Contractor shall submit one set of contract prints with red marks indicating As-built conditions of all piping, ductwork, and equipment, and incorporating changes made during construction. A record of as-built conditions shall be kept throughout the Project and shall be used in the preparation of the Final Record Drawings.

B. The Contractor shall provide digital images (minimum resolution of 1152 x 864 pixels in JPEG standard image file format) delivered via email or on CD, of any utilities/piping that are installed underground with a Reference Drawing indicating which direction each picture is taken. The Reference Drawing shall dimension the utility/piping from a prominent fixed object.

1.10 REFRIGERANT WARRANTY

A. Repair of refrigerant systems shall include prompt correction of all leaks and replacement of lost oil and refrigerant.

1.11 WARRANTIES AND GUARANTEES

A. The materials of the mechanical systems shall have the Manufacturer’s and/or supplier’s Guarantee or Warranty put into effect by execution and filing of any and all related papers. Minimum warranty shall be for one (1) year from date of substantial completion. Date of substantial completion shall be determined by the Owner. If the manufacturer’s standard warranty is for a longer period, it shall apply. Obtain service or repair under the terms of and said Guarantee or Warranty in behalf of the Owner.

B. The installed mechanical systems shall be delivered to the Owner in proper working order. Contractor shall warranty the mechanical system for a period of one (1) year, replace any work or material, which develops defects, excluding normal wear and tear, from the date of substantial completion.

C. Warranties and Guarantees shall be furnished in exact conformity with the requirements of the General Conditions.

1.12 OPERATING INSTRUCTIONS

A. Instructions: Instruct the Owner's representative in operation of the installed systems. The basis of these instructions shall be those written for inclusion in the maintenance and operating instruction data specified herein. Obtain certificates, signed by the Owner's representative, that these instructions have been received.

B. Notification: Notify the Owner at least five days before commencing operating period for refrigeration and heating equipment, as specified herein, in order that the Owner's representative may be present during that period.

1.13 DOCUMENTATION

A. Documents to be submitted prior to request for final inspection:

1. Maintenance Manuals per Section 23 01 00.
2. Test and Balance Report.
3. Three copies of multi-year warranties bound in a brochure with index listing equipment.

B. Data to be Delivered at Final Inspection:

1. Record Drawings.
2. Images of underground piping/utilities and related Reference Drawings.
3. Certificate by Owner's representative confirming that operating instructions have been received.

1.14 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Procedure: Refer to the General Conditions and Supplements thereto for submittal procedure of items called for in the Contract Documents.

C. Submittal data covering the work of this Division will be reviewed only after such items have been reviewed in detail and approved by the Contractor, such approval being indicated by suitable notations or stamp on the data.

D. Each submittal shall be clearly marked indicating Section and paragraph for which it is intended. Any deviations, exclusions or substitutions from specified material requirements shall be specifically identified in a summary sheet at the front of the submittal.

E. Where submittal sheets contain multiple products or selections, the specific item being submitted for review shall be clearly indicated with a red arrow (stamped or hand written). “Catalog” submittals (multiple items contained in the submittal, specific items not identified) will be rejected and not reviewed.

F. Submit the requested submittals in sufficient quantity to provide two copies in addition to those required by Contractor.

G. All fan and pump submittals shall include performance curves indicating flow, pressure, efficiency, and power requirements. For pumps, adjacent impeller selections shall be included. For fans, alternate RPM curves shall be included.

H. Motor Tabulation on all motors furnished listing the following nameplate data: Horsepower, voltage, phase and full load amps.

I. Submittal List: See the individual Mechanical Specification Sections for specific submittal requirements.

1.15 SHOP DRAWINGS GENERAL

A. Shop Drawings shall be complete and shall accurately show all items of equipment and material called for. The number of Drawings, and the view contained therein, shall be as needed to show the actual and final routing, construction, and final assembly of each system.

B. All Drawings shall be mechanically produced. Free-hand drawings are not acceptable.

C. All lettering shall be legible without use or aid of magnifying device. Legible free-hand lettering will be acceptable. Lettering shall be minimum 1/8" size.

D. Date all shop Drawings and provide a revision column.

E. Drawings shall be printed (or plotted) at either 24" high by 36" wide, or the same size as the Contract Drawings for the same trade, whichever is greater. Each drawing sheet shall be formatted the same as the Contract Documents (i.e., border width, title block, etc.). With the exception of Isometric drawings, all other drawings shall be drawn in two-dimension or at the same scale as the Contract Drawing of the same area, or as follows, whichever is the larger scale:

Drawing Type	Minimum Scale
Floor Plans	1/8" per foot
Roof Plans	1/8" per foot
Elevations	1/4" per foot
Details	3/4" per foot
Equipment Room Layouts	1/4" per foot
Housekeeping Pad Layouts	1/4" per foot
Isometrics	No scale
Riser Diagrams	1/4" per foot
Equipment Room Pad Layout with Electrical Stub-ups	1/4" per foot
All other plans and elevations	2" per foot

F. Three-dimensional views may be produced and used to provide supplemental information to that which is given on two-dimensional drawings. Three-dimensional drawings shall be drawn from a 30^{O} perspective.

G. In addition to information shown on the Contract Documents provide all additional data and notations needed to show conformance with Contract Documents. (i.e., air flow and volume from /to air devices).

H. For all drawings drawn two-dimension, all characteristics of the Contractor's equipment, systems and components shall be drawn to scale to designate their size. Use of dimensions alone to designate width, height, length, or depth is not acceptable. Drawings will not require that the reader "scale" them to determine sizes or location.

I. In the event either the Project as a whole, or the specific area covered by particular a shop Drawing, does not contain columns, floors and/or walls to which reference can be made in the location of items, alternate points of reference, as approved by the Architect, may be used.

J. Shop Drawings drawn at the same scale as the Contract Drawings shall incorporate the same areas, be arranged and be "broken" along the same lines as the Contract Drawings.

K. Duct and piping system which have following maximum width on one side shall be drawn in the following manner:

Drawing Scale	Object Dimension	Object Appearance Style
1. 1/8" per ft.	8” and Greater	Double-line
2. 1/8" per ft.	Less than 8"	Single-line
3. 1/4" per ft.	4” and Greater	Double-line
4. 1/4" per ft.	Less than 4"	Single-line
5. 1/2" per ft.	2-1/2” and Greater	Double-line
6. 1/2" per ft.	Less than 2-1/2"	Single-line
7. 3/4" per ft. and larger	2” and Greater	Double-line
8. 3/4" per ft. and larger	Less than 2"	Single-line
9. Flexible duct to diffusers		Single-line

L. Coordinate with all other trades that might impact installation of other systems, equipment or components.

M. Each shop Drawing shall contain a title block, which shall be the same size, layout and location, and have the same lettering size, as the Contract Drawings. Each drawing shall bear its own unique and descriptive designation. Adjacent to the title block shall be a space served for revision dates and identification.

N. Where adjacent areas of the building are continued on separate Drawings, provide a "match-line" at the edge of the Drawing area with an identifier directing the reader to the appropriate companion drawing.

O. Each plan view Drawing shall contain a "key plan" of the entire building, or a major portion of the building, to allow for the quick identification of the work area covered by the specific drawing and the orientation of the building (or area) as a whole. The key plan shall be proportionally accurate but not to exceed 4" x 4" in size.

P. The following minimum information shall be included on each plan view Drawing; ceiling, soffits, ceiling grid, light fixtures, partitions, room name and number, columns and other structural members, doors and/or door swings.

Q. Each drawing shall be revised to keep current with all modifications and revisions. Each modification shall be noted in the margin of each affected drawing. Notes shall consist of a unique modification number, date and brief notation on the reason for being made.

1.16 DUCTWORK SHOP DRAWINGS

A. Background information shall be redrawn scaled versions of the Architectural Floor or Reflected Ceiling Plans of the Contract Drawings and shall show all partitions, openings, and structural features. Drawings from the Contract Documents shall not be copied for use as backgrounds nor will reproducible drawings be made available from the Architect for this purpose.

B. Show fitting joints, fittings, equipment, required maintenance, removal and safe working clearances, elevations, location and sizes of access panels, net sizes (size of system less insulation), dimension from finished floor and/or overhead structure, horizontal dimension from centerline of columns, direction of flow, changes in size, changes in external covering, system material, construction classification, system name, internal liner, unique situations, equipment designation.

C. Show floor plan location of all space control and sensing devices (thermostats, humidistats, etc.) complete with the designation of the piece of equipment or component which device controls. Lines drawn between the sensing device to the controlled equipment or component, to designate their interaction, are not acceptable.

D. Sheet metal work shall be drawn using symbols and designations in accordance with the latest edition of "SMACNA Duct Construction Standards - Metal and Flexible".

END OF SECTION 23 00 10

SECTION 23 01 00
OPERATION AND MAINTENANCE OF HVAC SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Provide manuals in number of copies indicated under Section 01 77 00 Contract Closeout.

1.02 WORK INCLUDED

A. Material submitted in the manuals shall represent the equipment manufacturer, model, and type installed on the project.

PART 2 – PRODUCTS

2.01 GENERAL

A. Maintenance and Operating Manuals shall consist of the following as a minimum:

1. Each item of equipment requiring maintenance and operation data as noted in each specification section shall be provided with an index listing the types of equipment installed. Submittal data shall be included to the extent necessary to identify equipment, including summary sheet, such as model, size, air or water flow, pressure developed, speed, and motor size. Instructions shall include type and suggested frequency of maintenance, oiling, cleaning, disassembly, and reassembly directions, and wiring diagrams.
2. One section shall include a complete set of Record Control Drawings, bound in a plastic insert, full size, complete with a written sequence of operation for all control systems.
3. Letters, where factory startup or checking has been required, certifying completion of performance.

PART 3 – EXECUTION

3.01 GENERAL

A. Incomplete manuals will be returned to the Contractor for complete resubmission. Loose-leaf submittal of material at various stages of completion will not be acceptable.

END OF SECTION 23 01 00

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section of specifications deals with materials and methods pertaining to all work specified under Division 23.

1.02 RELATED SECTIONS

A. Division 23 Section “General Provisions – HVAC”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide submittal data showing starter dimensions, weight, electrical requirements, and service access requirements.

C. Provide submittal data showing motor horsepower, electrical requirements, and efficiency.

D. Provide submittal data showing firestop systems, including details for penetrations and instructions for installation

E. Provide manufacturer’s instructions, indicate installation and support requirements.

1.04 JOB CONDITIONS

A. Install all apparatus so as to maintain maximum headroom and clearances consistent with requirements of the Drawings and specifications.

B. All equipment requiring service shall be installed to permit access for servicing without damage to building structure or finishes.

PART 2 – PRODUCTS

2.01 DRIVES

A. Belt drives shall be sized for 150% of motor horsepower. Motor pulleys shall be cast iron, adjustable pitch for 15 hp and below, fixed pitch above 15 hp.

B. Drive speeds scheduled are estimated; provide fixed or adjustable pitch sheaves necessary to deliver scheduled air quantities based on actual static pressure in the system.

C. Multiple belt drives shall be used on motors 5 horsepower and larger.

2.02 DRIVE GUARDS

A. Drive guards shall be provided for all driven equipment. Drive guards shall be designed to meet OSHA requirements. Belt guards shall be constructed to meet SMACNA Low Pressure Duct Construction Standard, 1985, Appendix Figure 31.

B. Belt drive guards shall be constructed of galvanized expanded metal reinforced with galvanized angle steel frame. Guard shall be welded or formed of one piece of material.

C. Provide minimum 3" diameter access plate at motor shaft and driven apparatus shaft for belt guards. Access plates shall be attached with aircraft type locking wing nuts.

D. Drive guards shall be rigidly bolted to the frame of the equipment. All drive guards shall be removable.

2.03 MOTORS

A. Provide motors for all equipment required by the Mechanical Sections unless otherwise specified. Motors shall operate using Electrical characteristics shown on the Drawings and as specified. Multiple units of the same manufacturer's equipment shall be furnished with motors by one manufacturer. Motors shall be Century, Gold, Louis-Allies, Reliance, General Electric, Balder, Westinghouse, Marathon, or US Motors, except where furnished as part of packaged equipment.

B. Standards: Except where otherwise specified, motors shall be manufactured according to NEMA Standards. They shall be NEMA Design B, Continuous Duty, 1.15 service factor, Insulation Class B or F, 40°C. ambient and 40°C. rise. Hermetic motors shall be manufactured according to ARI Standards.

C. Efficiency: All design A & B squirrel-cage, foot mounted, single speed T-frame induction motors 1 hp and larger having synchronous speeds of 3600, 1800, and 1200, rpm shall have a nominal full-load motor efficiency no less than that shown below or shall be classified under NEMA standard as "ENERGY EFFICIENT": Please see the chart entitled "Minimal Nominal Full-Load Efficiencies (%)" at the end of this section.

D. Sizes:

1. Motors with standard NEMA Electrical characteristics shall be selected for the design brake horsepower without overload current at rated voltage. Motor horsepower rating shall not exceed 125% of the calculated maximum load being served. If a standard rated motor is not available within the range, the next larger standard motor size shall be used.
2. Motors with special electrical characteristics, such as hermetic refrigeration motors, shall be selected to product the brake horsepower required for the specified load without overload current at rated voltage.
3. Motors used with variable speed adjustable frequency controllers shall be suitable for inverter duty use, constructed in compliance with NEMA Standard MG 1-1998 Part 31 and selected to operate with the control characteristics and amperage limitations of the specific inverter selected. All motors associated with variable frequency drives shall be furnished with a factory-installed Shaft Grounding Ring (SGR) of conductive micro-fibers to redirect shaft currents from shaft to frame. Shaft Grounding Ring (SGR) shall be maintenance-free, brushless, split-ring or complete-ring configuration directly attached with mechanical fasteners. Attachment with adhesives in lieu of mechanical fasteners shall not be an acceptable substitution. SGR shall be by Aegis or equivalent.

E. Enclosures: Motor enclosures shall be open drip-proof, except where otherwise specified. Motors for equipment installed where subject to weather shall be fan cooled, totally enclosed weatherproof type, unless fully protected by a waterproof housing.

F. Nameplates: All motors shall have a nameplate showing the specified nominal system voltage as nameplate rated voltage. Each motor shall be guaranteed to operate satisfactorily at the specified nominal system voltage, plus or minus 10%.

2.04 CONTACTORS

A. Contactors shall be magnetic designed for resistance heating and tested for 100,000 cycles. Contacts shall be silver alloy. Enclosure shall meet the requirements of UL 508 with NEMA Type 1 indoors, and Type 3R outdoors. Provide one set of auxiliary contacts and control transformer with fused, grounded secondary. Holding coil voltage shall not exceed 120 volts.

B. Manufacturers: Clark Controller, Arrow-Hart, Cutler-Hammer, Allen-Bradley, Square D, Joslyn Clark, or Furnas.

2.05 STARTERS

A. Manufacturers: ABB Type PST motor starters or equal by Danfoss or Yaskawa.

B. Except as otherwise specified, furnish starter, providing thermal overload protection, for each motor specified herein. Overload elements shall be sized to protect motors. Overload protection shall be provided in each motor leg. Auxiliary contacts, NEMA A600 rated, shall be provided for wiring specified under "Controls". Contacts shall be Form C type, open on alarm. Provide two spare normally open and two spare normally closed contacts. Starters shall be constructed and rated for 50,000 amps withstand rating.

C. Unless noted otherwise, all automatically controlled motor starters shall be furnished with "hand-off-auto" selector switch, reset button and LED pilot light in cover.

D. Combination starters, except those specifically noted to have a fusible disconnect switch, shall also contain a circuit breaker type motor circuit protector with adjustable instantaneous magnetic trip and without thermal trip unit, UL listed for motor branch circuit protection. The frame size, trip rating and setting shall be selected on the basis of the horsepower of the motor as indicated on the Drawings. Disconnect or breaker handle shall have padlocking provisions.

E. All three phase starters serving motors over 208 volts shall have control transformer with fused 120 volt secondary. Holding coils shall be 120 volt. Provide overload protection for each of three phases. Enclosures shall be NEMA Type 1 for indoor locations and NEMA Type 3R for outdoor locations, unless otherwise noted.

F. All manual single phase starters shall be furnished with LED pilot light, NEMA Type 1 enclosure indoors, and NEMA Type 3R outdoors. Starters located in finished spaces shall be furnished with flush mounting enclosures.

G. Provide engraved plastic nameplate for each starter with description of equipment served. Nameplate shall state source of circuit, load served, circuit number if used, voltage and phase.

H. Provide oversized starter enclosures where required to enable installation of Time Mark device, specified above.

2.06 SUPPORTS AND HANGERS

A. Individual horizontal piping shall be supported as follows:

1. Steel and cast iron piping with painted clevis hangers, except steam and steam condensate 4" and larger shall be on roller hangers.
2. Hangers in contact with copper piping shall be copper plated swivel ring type.
3. Hangers around insulated copper piping shall be galvanized steel swivel ring type.
4. Copper piping exposed adjacent to structure shall be secured with copper plated pipe clamp.
5. All attachments in contact with copper piping shall be copper, copper plated or plastic coated.
6. Horizontal, parallel and adjacent piping shall be supported by gang hangers utilizing PVC coated channel and PVC coated standard pipe clamps or approved equal.

B. Concealed vertical piping shall be supported as follows:

1. Steel and cast iron piping with painted riser clamps.
2. Copper piping with copper plated riser clamps.

C. Exposed Vertical Piping shall be supported by attachment to wall at midpoint with offset pipe clamps. Clamp for uninsulated copper piping shall be copper plated or plastic coated.

D. Pipe in Chases: Piping in pipe chases shall be secured to building structure using attachments hereinbefore specified. Hangers for water piping within plumbing chases shall be supported with rods bolted to pipe clamps which shall be affixed to cast iron pipe. Piping may be supported from the more rigid cast iron pipe with the use of plastic brackets designed for that purpose.

E. Hangers and pipe attachments, except where otherwise specified shall be Elcen, Michigan Hanger Company, B-Line, or Grinnell.

2.07 STRUCTURAL ATTACHMENTS

A. Inserts:

1. Individual inserts shall be malleable iron type selected for the type and thickness of the slab and the load to be carried.
2. Continuous inserts shall be formed galvanized steel type selected for the type and thickness of the slab and the load to be carried. Inserts shall be furnished with end caps, closure strips and shall be anchored at 6" O.C.
3. Inserts shall be used in poured in place concrete slabs.
4. Inserts shall be Elcen, Michigan Hanger, Grinnell, or B-Line.

B. Concrete Fasteners:

1. Fasteners shall be self-drilling type, Locke Mfg. Co. "Bull Dog", Phillips "Red Head", or Diamond "Blue-Cut".
2. Fasteners shall be used in solid masonry walls and shall be used in solid concrete walls.

C. Toggle Bolts with not less than 1/4" diameter bolts shall be used in hollow type wall construction.

D. Clamps of configuration compatible with beams and steel members shall be used in steel construction. Clamps shall be Grinnell, Michigan Hanger Company, Elcen, or B-Line.

E. Hanger rods shall be selected to safely carry the load to be supported and shall not be less than the diameter listed by the hanger manufacturers for the specific size hanger used.

F. Structural attachments for sprinkler and standpipe systems shall be in accordance with NFPA 13, 1996 and NFPA 14, 1996 respectively.

2.08 FOUNDATIONS

A. Provide reinforced concrete foundations for all equipment located on floors, 4" high unless noted otherwise.

B. Concrete shall be 1:2:4 mix with neatly beveled edges and all surfaces rubbed smooth prior to mounting equipment. Foundations shall be reinforced with No. 3 bars a maximum of 12" o.c. each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate the slab waterproofing.

2.09 ACCESS PANELS

A. Access panels shall be flush concealed hinge and latch type complete with frame. Panels shall be minimum 24" x 24", selected for the specific type of ceiling or wall where installed. Locks shall be flush screw turn type.

B. Panels shall be primed for finish painting in ceilings or walls to be painted.

C. Panels installed in rated walls or ceilings shall be UL listed for the same rating as the wall in which they are to be installed, except 1½ hour panels are acceptable in two (2) hour walls.

2.10 PAINTING

A. Refer to Section 09 91 00 for Painting requirements.

2.11 FIRESTOP SEALANT

A. Firestop sealant shall be a synthetic elastomer caulk, strip, or sheet designed for use as a one part fire, smoke, and gas sealant. Material shall be intumescent and capable of being installed with caulk gun, shears, and putty knife. Material shall be UL classified and Factory Mutual approved for sealing in floors, walls, or partitions to 3 hour rating per ASTM E-814.

B. Fire barrier material shall be 3M Fire Barrier Sheet, Strip, and Caulk.

2.12 ASBESTOS

A. All materials used in this work shall be asbestos free.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All work shall be installed plumb and square unless clearly indicated otherwise. Installation shall be performed by competent persons, trained in their respective skills.

B. Furnish and install equipment complete, including connections, services and adjustments for systems to operate safely and in compliance with requirements of the Contract.

C. Install each item in full compliance with current recommendations of the manufacturer. Equipment manufacturer or his authorized representative shall furnish services and/or supervision necessary to ensure compliance with this provision. Conflict between manufacturer's recommendation and other Contract requirements shall be resolved before installation.

D. Requirements of the several acceptable manufacturers for each specified item of equipment may vary as to installation details, location and number of connections, dimensions and weight. Provide all Drawings, services, material, and labor necessary for the installation and proper functioning of the equipment furnished.

3.02 PROTECTION OF MATERIALS AND EQUIPMENT

A. Take precautions to protect all materials and equipment from damage during the construction process.

B. Do not store materials and equipment outdoors subject to weather without complete weather protection.

C. Do not install materials or equipment in a partially constructed structure exposed to weather, unless all material and equipment is continuously protected from damage by weather or the construction process.

D. Material and equipment damaged by improper protection during construction is subject to replacement based on the judgment of the Architect’s Engineer at no cost to the Owner.

3.03 CUTTING AND REPAIRING

A. Cut and repair all walls, floors, and ceilings necessary for the installation of the mechanical work, but no cutting of work of other trades will be permitted without the consent of the Architect.

B. All cutting and repairing of walls, floors, and ceilings shall be subject to the supervision and approval of the Contractor.

3.04 CLEANING AND FINAL CLEAN-UP

A. Keep the premises free of waste, debris and surplus materials.

B. After equipment has been installed, remove all extraneous materials, rust and stains; blow, vacuum or flush all foreign matter from all equipment.

C. Identification plates on equipment shall be free of paint and shall be polished.

3.05 EXCAVATION AND BACKFILL

A. Do all trenching, excavating and backfilling required for the Mechanical Sections. Include all necessary repairing, shoring, bracing, pumping and protection for safety of persons and property. Repairing shall be comparable to work cut and shall be approved by the proper authorities.

B. Slope sides of excavations to comply with OSHA regulations and local ordinances having jurisdiction. Shore and brace where sloping is not possible either because space restrictions or stability of materials excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. Care shall be taken to avoid existing facilities in excavating. Contractor shall be responsible for all damage to existing facilities in executing this work.

D. Excavate rock to depth of 6" below bottom of pipe. Space between rock and pipe shall be filled with sand.

E. Bottom of trenches shall be graded to secure the required fall. Size of bell holes for soil and sewer pipe shall be held to a minimum so that the entire pipe length rests on compacted fill or undisturbed earth.

F. Backfill shall be placed completely under pipe haunches and in bell holes and uniformly tamped in 6" layers. Backfill over top of pipe with select materials free of clods, stones, boulders, and foreign materials. Back fill shall not be installed until pipe is insulated, tested and field inspected by inspector.

G. Backfill shall be compacted to 95% of maximum dry density as determined by a Standard Proctor Test, ASTM-D698, except where under areas to be paved, top 12 to 24 inches of fill shall be compacted to 97% dry density by above standard.

3.06 DRIVES AND GUARDS

A. All belt drive alignments shall be properly checked and set prior to starting machinery.

B. Adjust drives to deliver air quantities scheduled at actual static pressures. Change sheaves to meet actual conditions, if required.

C. Provide one set of spare belts to be turned over to the Owner at the completion of the work for each air handling unit drive.

D. All equipment guards shall be OSHA compliant and installed prior to operation of equipment.

3.07 MOTOR VOLTAGES

A. All motor voltages shall be checked with the Electrical Drawings prior to preparation of submittals or ordering of equipment.

3.08 MOTOR STARTER OVERLOADS

A. Motor overload heaters shall be sized and installed to protect the actual motor furnished.

3.09 PIPING SUPPORTS AND ANCHORS

A. Waste, drain and relief valve discharge piping shall be securely anchored to structure, equipment or concrete base. Piping shall be located with two inches clear above the floor.

B. Combination riser clamps may be used where more than one pipe passes through floors.

C. Riser clamps for support of risers shall span penetration of slot or sleeve in floor. In exposed location, use short span clamps.

D. Hang all piping so that equipment flanges and connections bear none of weight of piping. At pump suction and discharges, piping shall be supported free of pump casing through the use of base elbows.

E. Horizontal supports shall be spaced as follows:

1. Steel piping at not more than 10' intervals.
2. Cast iron piping at 5' intervals, except supports shall be placed at intervals equal to the pipe length but not to exceed 10'. Also, no hub pipe over 3" size shall be supported at each change from horizontal to vertical or vertical to horizontal direction.
3. Copper piping 1-inch and smaller at 8' intervals; larger than 1-inch at 10' intervals.
4. PVC piping at not more than 4’ intervals.
5. PVC piping 1½” and under shall be supported at 4’ intervals maximum.

F. Vertical supports shall be spaced as follows:

1. Steel piping at every other story height.
2. Copper piping larger than 1-inch at every other story height; 1-inch and smaller at every story height.

G. Sprinkler piping and standpipe shall be supported and anchored as required by NFPA 13, 1996, and NFPA 14, 1996 respectively.

3.10 HANGER SIZES

A. Hangers shall be sized to fit the pipe except for the insulated piping, in which case hangers shall be of size for pipe and insulation to pass through.

B. See Insulation for Pipe Saddles.

3.11 STRUCTURAL ATTACHMENTS

A. Inserts shall be used for individual loads exceeding 150 lbs. Concrete fasteners may be used where approved in writing by Architect for individual loads of 150 lbs. or less.

B. Inserts shall be secured to the forms before the pouring of concrete. In all spaces with exposed concrete ceilings, the openings not filled with rods and nut shall be filled with cement grout flush with the ceiling.

C. Shooting of fasteners into the slab shall be allowed only in approved locations.

D. Devices for connection to the structure shall not be loaded more than 75% of the manufacturer's rated load.

3.12 ACCESS PANELS

A. Access panels shall be installed at all points where equipment, devices or apparatus requiring adjustment, maintenance or servicing cannot be readily accessed through the ceiling or wall.

B. Accessible ceilings are defined as lay-in frame type and access panels are not required for equipment or apparatus above these ceilings.

C. Panels shall be located so that apparatus or equipment can be reached by an arm's length.

3.13 FIRESTOP SEALING FLOOR AND WALL PENETRATIONS

A. Where ductwork, piping, control tubing, and conduit penetrate fire or smoke rated walls and floors, the penetration shall be sealed with fire barrier herein specified.

B. Fire barrier shall be installed in strict accordance with manufacturer's printed instructions. Material shall be installed with sufficient depth to maintain a fire endurance rating equivalent to that of the adjacent wall or floor.

3.14 REFRIGERATION SYSTEMS

A. Any work required on new or existing refrigeration systems shall involve the use of a refrigeration recovery/recycling unit. All refrigerants shall be stored and reused in the system where the refrigerant condition allows. Intentional release of refrigerant is prohibited and will not be allowed.

3.15 LUBRICATION

A. All equipment installed under this division shall be properly lubricated in accordance with the manufacturer’s instructions and recommendations before it is operated during the installation period, and shall be checked again before Substantial Completion is signed.

END OF SECTION 23 05 00

	Minimum Nominal Full-Load Efficiency (%)					
	Open Motors			Enclosed Motors		
Number of Poles	**2**	**4**	**6**	**2**	**4**	**6**
Synchronous Speed (RPM)	**3600**	**1800**	**1200**	**3600**	**1800**	**1200**
Motor Horsepower						
1.0	-	82.5	80.0	75.5	82.5	80.0
1.5	82.5	84.0	84.0	82.5	84.0	85.5
2.0	84.0	84.0	85.5	84.0	84.0	86.5
3.0	84.0	86.5	86.5	85.5	87.5	87.5
5.0	85.5	87.5	87.5	87.5	87.5	87.5
7.5	87.5	88.5	88.5	88.5	89.5	89.5
10.0	88.5	89.5	90.2	89.5	89.5	89.5
15.0	89.5	91.0	90.2	90.2	91.0	90.2
20.0	90.2	91.0	91.0	90.2	91.0	90.2
25.0	91.0	91.7	91.7	91.0	92.4	91.7
30.0	91.0	92.4	92.4	91.0	92.4	91.7
40.0	91.7	93.0	93.0	91.7	93.0	93.0
50.0	92.4	93.0	93.0	92.4	93.0	93.0
60.0	93.0	93.6	93.6	93.0	93.6	93.6
75.5	93.0	94.1	93.6	93.0	94.1	93.6
100.0	93.0	94.1	94.1	93.6	94.5	94.1
125.0	93.6	94.5	94.1	94.5	94.5	94.1
150.0	93.6	95.0	94.5	94.5	95.0	95.0
200.0	94.5	95.0	94.5	95.0	95.0	95.0

SECTION 23 05 29
EQUIPMENT SUPPORTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the equipment support rails and pipe caps.

1.02 RELATED SECTIONS

A. Section 23 05 00 Common Work Results for HVAC

B. Section 23 31 00 Ductwork

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide shop drawing showing dimensions, materials of construction, size, and quantity provided.

C. Provide manufacturer's instructions; indicate installation and support requirements.

1.04 QUALITY ASSURANCE

A. Curbs and roof supports shall be constructed per the National Roofing Contractors Association requirements.

B. Curbs shall be designed to support the actual equipment to be installed.

PART 2 – PRODUCTS

2.01 EQUIPMENT SUPPORT RAILS

A. Rails shall be 12″ high heavy gauge galvanized steel rails with continuously mitered and welded corners, raised cant, and galvanized counter flashing over pressure-treated wood nailer.

B. Rails shall be PATE ES-5 or equivalent by Portals Plus, Roof Products and Systems, or Curbs Plus.

2.02 ROOF CURBS

A. Curbs shall be 12″ high, heavy gauge galvanized steel, unitized with full mitered corners, all seams welded, 1½″ thick insulation, pressure-treated wood nailer, and raised cant.

B. Curbs shall be PATE PC-5 or equivalent by Portals Plus, Roof Products and Systems, or Curbs Plus. Curbs supplied as an option with rooftop equipment is acceptable when the curb is manufactured by the same provider and meets the basic requirements listed above.

2.03 PIPE CAPS

A. Pipe caps shall consist of heavy gauge galvanized steel curb with raised cant, insulated housing, wood nailer, and acrylic clad thermoplastic cover with graduated step boots and stainless-steel clamps.

B. Pipe caps shall be PATE PCC series or equivalent by Portals Plus or Roofing Products and Systems.

2.04 ROOF PIPE SUPPORT

A. Pipe support shall be constructed of a rigid polycarbonate base one-piece casting with polycarbonate resin roller, polycarbonate rod, and aluminum pipe strap compatible for use with built-up and single-ply roofing membranes. Pipe support shall accommodate up to 3″ pipe size. Pipe support shall be Miro Industries Model 3-R-4.

PART 3 – EXECUTION

3.01 SUPPORTS

A. Support condensing units on equipment support rails.

B. Extend any piping penetrating the roof, through the roof with pipe caps.

C. Support gas piping on the roof on pipe supports. Secure pipe strap to supports with stainless steel screws. Pipe straps should NOT be rigidly attached to pipe itself.

3.02 ATTACHMENTS TO CURBS AND RAILS

A. Secure equipment to curbs with lag screws maximum 18″ O.C.

B. Bolt equipment with legs to equipment support legs at all support points.

END OF SECTION 23 05 29

SECTION 23 05 48
SEISMIC RESTRAINTS - HVAC

PART 1 – GENERAL

1.01 DESCRIPTION

A. General provisions and other systems are specified in other sections of Division 23.

B. This section outlines requirements for seismic restraints for mechanical equipment.

1.02 STANDARDS

A. International Building Code (IBC), 2012 Edition, Section 1613.

B. American Society of Civil Engineers/Structural Engineering Institute ASCE/SEI 7-10 “Minimum Design Loads for Buildings and Other Structures".

1.03 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 05 00 Common Work Results for HVAC

C. Section 23 31 00 Ductwork

1.04 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide product data showing materials provided (anchors, cables, etc.).

C. Provide calculations for hanger and anchors showing operating loads, required seismic loading, and ultimate load allowed on anchor. Required loading shall not exceed percentage listed herein of anchor ultimate load allowed.

D. Provide scaled floor plan drawings, showing locations and types of seismic restraints required.

E. Provide manufacturer’s certificate of seismic force compliance for all non-exempt mechanical equipment.

F. Provide project-specific design and documentation for mechanical components and designated seismic systems and their supports and attachments in compliance with ASCE/SEI 7-10. Design and documentation shall be:

1. Prepared, stamped, and signed by a design professional registered in the same state as the project location or
2. Submittal of the manufacturer's certification that the equipment is seismically qualified as listed in ASCE/SEI 7-10 Section 13.2.1.2.

G. Any exempt system or component shall be listed, along with the corresponding Building Code Section allowing the exemption.

H. Any exceptions for system equipment or components shall be listed, along with the corresponding Building Code Section allowing the exception.

I. Provide a quality assurance plan for seismic requirements for all mechanical components and designated seismic systems as listed below in paragraph 3.1. Plan shall be stamped and signed by a design professional registered in the same state as the project location. Quality Assurance Plan shall meet the requirements in ASCE/SEI 7-10 Appendix 11A.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Sheetmetal straps shall be galvanized steel as specified in Section 23 31 00 Ductwork.

B. Hangers shall be as specified in Section 23 05 00 Common Work Results for HVAC.

C. Cables shall be wire coil, zinc coated to 0.4 ounces/ft² or A304 stainless steel. Strength of cables shall be minimum as follows:

Size, Inches	Breaking Strength, Pounds
1/4″ (minimum size)	4,940
3/8″	10,980
1/2″	19,260

D. Hot-rolled steel shapes shall conform to ASTM 36. Pipe used as restraints shall be constructed per ASTM A-120 or A53.

E. Bolts shall conform to ASTM A307.

F. Expansion anchors shall be as specified in Section 23 05 00 Common Work Results for HVAC.

G. Specialty seismic hangers, supports, and restraint equipment shall be by Amber/Booth (VMC), Mason, or Vibration Isolation.

PART 3 – EXECUTION

3.01 MECHANICAL EQUIPMENT REQUIRING RESTRAINTS

A. The following equipment shall require seismic restraints meeting the requirements of ASCE/SEI 7-10 Chapter 13, except where the requirements of the exceptions listed below are met.

1. All equipment, ductwork, piping and systems shall be needed for the continued operation of the facility and thereby shall be require seismic restraints.
2. Seismic restraint exemptions as listed in ASCE/SEI 7-10 section 13.1.4.4 & 13.1.4.5.
3. Seismic restraints exceptions as listed in ASCE/SEI 7-10 sections 13.6.7 (Ductwork), and 13.6.8.3 (Piping).
4. Seismic restraint exception in ASCE/SEI 7-10 section 13.6.8.2 states that fire protection piping, pipe hangers and bracing designed and constructed in accordance with NFPA 13 shall be deemed to meet the requirements of this section.

B. Designated Seismic Equipment: Certifications shall be provided for designated seismic systems in accordance with ASCE/SEI 7-10 requirements.

C. Building Occupancy Category = Mixed- Use. "R-2, S-2, B".

D. Seismic Design Category = "D".

E. Spectral Response Acceleration Parameter in Short Period SDS = 0.208.

3.02 SUPPORT REQUIREMENTS

A. Seismic support shall be provided for both transverse and longitudinal restraint.

B. Seismic attachments shall transfer the seismic force to the building structure. The attachments shall be positively secured, supports using frictional resistance are prohibited.

C. Loading for sizing hangers, supports, and attachments shall comply with the requirements of Section 9.6 of ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures" using the following criteria:
Sds = design spectral response acceleration at short period, which = 0.208 for this specific building.
Ip = the importance factor for the component, which = 1.5 for all systems on this Project.

D. Hangers, cables, and angle supports shall not be preloaded or tensioned, but snug and not slack.

E. Seismic restraints shall be installed per the Seismic Restraint submittal data. Refer to this documentation for restraint locations, specific attachment details, hanger sizing and support requirements.

F. Consequential Damage: The functional and physical interrelationship of components, their supports, and their effect on each other shall be considered so that failure of an essential or nonessential mechanical component shall not cause the failure of an essential architectural, mechanical, or electrical component.

G. Flexibility: The design and evaluation of components, their supports, and their attachments shall consider their flexibility as well as their strength.

END OF SECTION 23 05 48

SECTION 23 05 49
VIBRATION ISOLATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section specifies vibration isolation requirements for Mechanical Systems.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions - HVAC

B. Section 23 05 00 Common Work Results for HVAC

C. Section 23 05 29 Equipment Supports

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide product data, including schedule of isolator type, associated equipment, and load at each point based on manufacturer's operating weight, and actual deflection at each loading point for each piece of isolated equipment.

C. Provide manufacturer's installation instructions, including setting and anchoring instructions.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. All vibration isolation equipment shall be furnished by one manufacturer. Equipment shall be by Aeroflex (VMC), Amber/Booth (VMC), Mason, or Vibro-Acoustics (Swegon).

2.02 ISOLATION EQUIPMENT

A. Isolation equipment selection shall be based on actual mechanical equipment to be installed, providing uniform load distribution and deflection.

2.03 ISOLATORS

A. Isolators shall conform to the following:

1. Type 1. Spring isolators, free standing, laterally stable, unhoused, bolt holes in base, top leveling bolt, and neoprene acoustical isolation pad on base. Horizontal to vertical stiffness ratio shall not be less than .8. Spring outside diameter shall not be less than .8 of the operating height. Minimum additional travel to solid shall not be less than 50% of rated deflection.
2. Type 2. Isolators shall be similar to Type 1 except housed. Isolators shall have, in addition to Type 1 requirements, vertical adjustable limit stops, and inserts to isolate limit stops from housing.

3. Type 3. Neoprene double deflection base mount isolators with all metal surfaces covered, bolt holes, and ribbed top and bottom.
4. Type 4. Double deflection neoprene hanger type isolator with neoprene bushing between hanger and rod housing to prevent metal to metal contact.
5. Type 5. Combination hanger isolator with spring and double deflection neoprene element in series and neoprene bushing in base to prevent metal to metal contact. Spring diameter shall not be less than .8 of the operating height. Springs should have a minimum deflection of 1″, with not less than 50% additional travel to stop. Rod shall be able to swing 20° out of alignment before contacting housing.
6. Type 6. Twin sphere piping flexible connectors constructed of neoprene reinforced with multi-layer nylon tire cord fabric and galvanized ductile iron flanges. Isolators shall be complete with control cables and shall be rated for operation at 180 psi at 200°F.
7. Type 7. Molded neoprene isolator pad, waffle molded surface top and bottom, selected for loading of 40 psi unless noted otherwise. Pad shall be a minimum of ½″ thick.
8. Isolators located on systems installed outdoors shall have weatherproof finish.

PART 3 – EXECUTION

3.01 INSTALLATION

A. There shall be no direct contact of isolated piping or equipment with shaft walls, floor slabs, partitions, or conduits.

B. Where recommended by the manufacturer, isolator base plates shall be bolted to the structure or foundation. Bolting shall incorporate neoprene bushings and washers.

C. After installation, verify isolators are properly adjusted, with springs perpendicular to bases or housing, adjustment bolts are tightened up on equipment mountings, and hangers are not cocked.

END OF SECTION 23 05 49

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the identification requirements for the mechanical systems.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 05 00 Common Work Results for HVAC Systems

C. Section 22 10 05 Plumbing Piping and Drainage Accessories

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide product data showing label illustrations and application locations.

1.04 SUMMARY:

A. Section includes:

1. Plastic Coiled Pipe Markers.
2. Pressure Sensitive Adhesive Pipe Markers.
3. Underground Warning Tape.
4. Duct Identification.
5. Valve Tags and Schedules.
6. Engraved Plastic Signs.
7. Engraved Equipment Markers.
8. Plastic Tags.

1.05 REFERENCES

A. American National Standards Institute (ANSI): ANSI A13.1 Scheme for the Identification of Piping Systems, current edition.

B. Department of Labor 29 CFR 1910.1200.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer’s technical product data and installation instructions for each identification material and device required.

B. Schedules: Submit valve schedule for each piping system, typewritten and produced on 8½″ x 11″ bond paper. Include valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and any variations for identification. If addition to framed copies, furnish extra copies for maintenance manuals as specified in Division 1.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification products of types and sizes required, whose products have been in satisfactory use for a period of five (5) years.

B. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification products.

PART 2 – PRODUCTS

2.01 MECHANICAL IDENTIFICATION MATERIALS

A. Provide manufacturer's standard products for each application as referenced in this section.

2.02 PIPE MARKERS

A. Pressure-Sensitive Type: Provide manufacturer's standard preprinted, permanent adhesive, color-coded pressure sensitive vinyl labels complying with ANSI A13.1. Color-coded plastic adhesive flow directional arrow tape, full circle at both ends of the pipe marker, tape overlapped 1½″. Use 1″ tape for piping less than 2½″, 2″ tape for 2½″ through 8″ piping, and 4″ tape for larger piping.

B. Lettering: Comply with ANSI A 13.1 for piping system nomenclature. Abbreviate only as necessary to accommodate marker length.

2.03 PLASTIC DUCT MARKERS

A. Pressure-Sensitive Type: Provide manufacturer's standard preprinted, 2¼″ x 13″, permanent adhesive pressure sensitive vinyl duct markers complying with ANSI A13.1 indicating duct service (supply, return, exhaust, etc.). Include separate directional arrows to indicate airflow.

2.04 UNDERGROUND TYPE PLASTIC LINE MARKERS

A. Metallic Piping: Provide manufacturer's standard non-detectable permanent, continuous printed plastic tape, intended for direct burial service, not less than 3″ wide by 4 mils thick. Provide tape with printing most accurately indicating type of service of buried pipe.

B. Non-Metallic Piping: Provide manufacturer's standard detectable, multi-ply tape consisting of solid aluminum foil core between two layers of plastic tape, not less than 3″ wide by 5 mils thick. Provide tape with printing most accurately indicating type of service of buried pipe.

2.05 VALVE TAGS

A. Plastic Tags: Provide manufacturer's standard 1/16″ plastic engraved tags, 1½″ square, black with white lettering, with ¼″ high service indicator on top line and ½″ numbers below.

B. Valve Tag Fasteners: Use solid brass "S" hooks for installation of valve tags.

C. Chart Frames: Provide one (1) aluminum 8½″ x 11″ valve chart frame with glass lens for each valve schedule provided.

D. Access Panel Markers: Provide manufacturer's standard 1/16″ thick engraved plastic access panel markers with abbreviations and numbers corresponding to the concealed valve.

2.06 ENGRAVED PLASTIC EQUIPMENT MARKERS

A. Provide manufacture's standard 1/16″ engraved equipment tags matching the terminology on schedules as closely as possible. Use black with white letters, 1″ x 3″ or 1½″ x 4″ for control devices, dampers, and valves and 4″ x 6″ for equipment. Use green with white letters, 3″ long x the ceiling grid width for equipment above lay-in ceilings.

2.07 PVC JACKET

A. Provide on all new piping insulation located in Mechanical Rooms and in spaces with no ceilings. Protective jacket shall be pre-molded, with color imbedded in factory PVC, high impact type, UV resistant, flame spread and smoke developed 25/50 rated per ASTM E 84 and shall have minimum 0.030″ thickness. Manufacturers shall be Johns Manville, PIC-Plastics, Speedline, or Proto.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Where identification is to be applied to surfaces requiring painting, insulation, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 MARKER LOCATION

A. Install pipe markers on each system indicated, include arrows showing normal direction of flow.

B. Schedule of Piping Identification:

Piping Systems and Contents	Tape Background Color	Stenciled Legends
Condensate	Yellow	Condensate

C. Locate pipe markers and/or color bands (if required) wherever piping is exposed to view, and at least one marking per room above suspended ceilings. Per the following:

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units mark each branch where there might be a question of flow direction.
3. Near locations where pipes pass through walls, floors, or ceilings or where they enter non-accessible locations.
4. Behind removable panels and other access points permitting view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. On piping above removable acoustical ceilings.
7. At maximum intervals of 40′ along each straight pipe run, except to 25′ in congested areas.

3.03 DUCTWORK IDENTIFICATION

A. General: Identify air supply, return, exhaust, intake, and relief ductwork with duct markers as specified.

B. Location: In each space where ductwork is exposed or concealed by removable ceilings. Locate markers near points where ductwork originates or continues into concealed enclosures, and at 50′ spacing along exposed runs.

C. Access Doors: Provide duct markers or signs on each access door in ductwork and housings indicating purpose of access (to what equipment), instructions, and appropriate safety and procedural information.

D. Concealed Doors: Where access doors are concealed above acoustical ceilings or other similar concealment, plasticized tags may be installed in lieu of specified signs.

3.04 UNDERGROUND PIPE IDENTIFICATION

A. During backfilling of each exterior underground piping system, install continuous underground plastic line markers directly over buried line at 6″ to 8″ below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16″ install a single line marker.

3.05 VALVE IDENTIFICATION

A. Provide a valve tag on every, cock, and control device in each piping system. Exclude check valves and valves within factory fabricated equipment units. List each tagged valve in a valve schedule for each piping system.

3.06 EQUIPMENT IDENTIFICATION

A. Install engraved plastic signs or equipment markers on or near each major item of mechanical equipment and each operational device, per the equipment schedule. Attached tag to the ceiling grid directly under equipment installed above lay-in ceilings. Provide markers for the following general categories of equipment and operational devices.

1. Fuel burning units including boilers, furnaces, heaters, stills, and absorption units.
2. Pumps, compressors chillers, condensers, and similar motor driven units.
3. Fans, blowers, primary dampers, and mixing boxes.

B. Method of Installation: Use stainless steel screws except where adhesive is necessary because substrate cannot or should not be penetrated. Use rivets for tags attached to the ceiling grid.

END OF SECTION 23 05 53

SECTION 23 05 93
TESTING, BALANCING AND ADJUSTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for testing and balancing the Heating, Ventilating, and Air Conditioning Systems.

1.02 RELATED SECTION

A. Section 23 00 10 General Provisions HVAC

1.03 QUALIFICATIONS

A. The test and balance work shall be performed by an independent firm certified by the Associated Air Balance Council (AABC), or National Environmental Balancing Bureau (NEBB).

1.04 PROCEDURES

A. All air distribution systems and hydronic systems shall be tested, adjusted, and balanced to the conditions specified and/or shown on the drawings.

B. Performance of systems and components at specified conditions shall be verified by testing.

C. Before request for final inspection, calibrate, adjust, set, test and check all valves, dampers, temperatures, pressures, and flow rates of systems for operation and performance.

D. All test and balance work shall be performed in accordance with AABC or NEBB procedures.

1.05 REPORTS

A. Submit completed and certified report to Architect in triplicate.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide all instruments, charts, materials, and equipment required to develop a complete test and balance report.

PART 3 – EXECUTION

3.01 TEST AND BALANCE REPORT

A. Test and balance report shall be a complete document, not limited to, but including at least the following:

1. Air side of systems:

    a. Coil entering and leaving temperatures.
    b. All air unit component pressure drops.
    c. Fan rpm and entering and leaving static pressure.
    d. Air flow readings for all diffuser outlets and exhaust grilles.
    e. Air flow and pressure drops for all terminals. Where heating coils are included, data shall be same as under Coils and Heat Exchangers.
    f. Space temperatures at thermostats.
    g. Outlet temperatures of selected diffusers.

2. Coils, Pumps and Heat Exchangers:

    a. Entering medium temperature, flow rate, and pressure.
    b. Leaving medium temperature, flow rate, and pressure.

3. Pumps:

    a. Flow rates.
    b. Entering and leaving pressures.
    c. Verify alignment.
    d. Pump speed.

4. Electric Motors:

    a. Full load amperes, voltage, and horsepower.
    b. Installed starter heater size.

5. Controls:

    a. Operational setting of controllers and instruments.
    b. Positioning and function of valves and dampers.
    c. Interlock and operation of system functions.
    d. Thermostat differential setting.

6. Refrigeration System:

    a. Compressor safety and operating controls.
    b. Capacity reduction and low ambient controls.
    c. Expansion valve superheat.
    d. Operating pressure at each controller position.
    e. Compressor full load amperage in each phase and voltage.
    f. Condenser fan amperage and voltage, if applicable.

7. Fire Dampers: At selected dampers, blades will be dropped to prove close-off without binding.
8. Smoke and Fire/Smoke Dampers: Provide operation of all dampers on activation of smoke detectors or fire alarm signal.

3.02 BALANCING AND ADJUSTMENT AFTER FINAL INSPECTION

A. After building is accepted and occupied, and after testing and preliminary balancing are completed, send qualified personnel to building for not less than one period during summer and one period during winter, observe temperatures throughout conditioned spaces, consult with Owner's representative as to need for additional balancing or adjustment, then perform such work as is indicated.

B. Schedule these visits, at a time agreeable to Owner, during December through February for heating, and July through August for cooling.

3.03 COMMISSIONING REQUIREMENTS

A. The contractor shall provide a minimum of three (3) days' notice to schedule the Commissioning Agent to be on site during all Testing and Balancing activities.

B. The contractor shall submit a "Test and Balance Execution Plan" indicating their overall schedule for waterside and airside equipment work with descriptions of their balancing procedures for approval by the Engineer and Commissioning Agent a minimum of one (1) month prior to staring any field work.

C. Contractor shall be on site during the commissioning Acceptance Testing Phase prior to building occupation, during the Warranty Phase's two (2) HVAC system commissioning off-season tests (August afternoon and January), and during the commissioning 10-month warranty site visit for re-commissioning.

END OF SECTION 23 05 93

SECTION 23 07 00
HVAC INSULATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Insulation specified in this Section is for insulation used in Division 23 work.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 21 13 Hydronic Piping

C. Section 23 23 00 Refrigerant Piping and Accessories

D. Section 23 31 00 Ductwork (ductliner requirements)

E. Section 23 82 37 Misc. Electric Heaters (heat trace requirements)

1.03 DEFINITIONS

A. Exposed piping and ductwork is work that can be seen when the building is complete without opening or removing access doors or panels.

B. Other piping and ductwork is considered to be concealed.

1.04 INSPECTION

A. Surfaces to be insulated shall be clean, dry, and free of foreign material such as rust, scale, and dirt when insulation is applied. Perform pressure tests required by other Sections before applying insulation.

B. Where existing insulation is damaged due to the new work, repair damage to match existing work or replace damaged portion with insulation specified for new work.

1.05 QUALITY ASSURANCE

A. Products of the listed manufacturers will be acceptable for use for the specific functions noted. All materials shall be compatible with the materials to which they are applied, and shall not corrode, soften, or otherwise attack such material in either the wet or dry state.

B. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

C. Insulation shall be applied by experienced workers regularly employed for this type work.

1.06 RATING

A. Insulation and accessories, unless specifically exempted, shall have a composite flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50. Materials that are factory applied shall be tested as assembled. Materials that are field applied may be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

B. Flame-spread and smoke-developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, ASTM E-84 or UL 723.

C. Products or their shipping cartons shall bear a label indicating flame-spread and smoke-developed ratings.

D. Treatment of pipe jackets and duct facings to impart flame and smoke safety shall be permanent.

1.07 ASBESTOS

A. All materials used in this work shall be asbestos free.

PART 2 – PRODUCTS

2.01 INSULATION APPLICATIONS

A. Duct Insulation – Denoted by Type D:

1. Interior concealed supply ductwork:

   a. Type D8 glass fiber, flexible, low VOC, 2″ thick.

2. Interior concealed return ductwork (insulation not required for ducts located in unventilated attics with roof insulation or crawlspaces):

   a. Type D8 glass fiber, flexible, low VOC, 2″ thick.

3. Interior concealed outside air (tempered) and exhaust ductwork connected to energy recovery units:

   a. Type D8 glass fiber, flexible, low VOC, 2″ thick.

4. Interior exposed supply ductwork in mechanical rooms:

   a. Type D10 glass fiber, rigid, ASJ, 1½″ thick.

5. Interior exposed supply ductwork, unlined, and within 25′ of an exterior door, or as noted on the drawings:

   a. Type D10 glass fiber, rigid, ASJ, 1½″ thick.

6. Interior exposed outside air (tempered) and exhaust ductwork in mechanical rooms connected to energy recovery units:

   a. Type D10 glass fiber, rigid, ASJ, 1½″ thick.

7. Interior exposed outside air ductwork in heated only mechanical rooms:

    a. Type D10 glass fiber, rigid, ASJ, 1½″ thick.

8. Exterior supply and return ductwork and exterior outside air (tempered) and exhaust ductwork connected to energy recovery units:

    a. Type D4 elastomeric, with membrane, 2″ thick.

9. Interior concealed kitchen range hood or oven hood ductwork:

    a. Type D6 mineral fiber, 2 layers for a total of 4″ thickness.

B. Mechanical Equipment: Insulation - denoted by Type E:

1. Interior cold equipment (chillers, chilled water pumps, chilled water storage tanks, chilled water heat exchangers, or any other equipment subject to sweating):

    a. Type E1 elastomeric, 1″ thick.

2. Interior hot equipment (converters, heat exchangers, flash tanks, or any equipment with surface temperatures above 130°F, except pumps and expansion tanks):

    a. Type E2 glass fiber, rigid, 2″ thick.

C. Pipe Insulation – Denoted by Type P:

1. Interior condensate piping from coils and heat exchangers:

    a. Type P8 elastomeric tube, ¾″ thick.

2. Interior Refrigerant piping systems:

    a. Type P8 Elastomeric, ¾″ thick for suction and hot gas up to 1″ and 1″ thick for suction and hot gas larger than 1″

3. Exterior above grade Refrigerant piping systems:

    a. Type P10 Elastomeric, ¾″ thick for suction and hot gas up to 1″ and 1″ thick for suction and hot gas larger than 1″

2.02 ACCESSORY MATERIALS

A. Low VOC adhesives, sealants and mastics shall be selected as recommended by the insulation manufacturer. Adhesives shall be water based, and must comply with the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168, with a maximum VOC emission of 70 grams per liter. Low VOC water based sealants and mastics shall be manufactured to comply with NFPA 90A, UL listed and complying with ASTM E84 and comply with the current VOC limits of the SCAQMD Rule #1168, with a maximum VOC emission of 250 grams per liter. They shall be manufactured by the insulation manufacturer or by Foster, Hardcast, or 3M.

B. Adhesives, sealants and mastics which secure a vapor barrier material shall be of the vapor barrier type.

C. Adhesives, sealants and finishes for surfaces above 70°F shall be of the "breather" type.

D. Insulation jackets shall have a vapor barrier when applied to surfaces subject to sweating in an ambient environment up to 90°FD.B. and 80°FW.B., including chilled water, condensate drain, refrigerant suction, and ice water.

E. Where specified, finish jackets for all insulation in the building shall be not less than 8 oz./sq. yd. white, pre-sized glass cloth kraft paper reinforced by Carolina or Twinsburg-Miller.

F. All finish mastics and sealants shall be white in color, unless noted otherwise.

G. Pre-formed fitting jackets shall be one piece molded PVC with a 25/50 flame spread smoke developed rating.

H. Aluminum jackets shall be corrugated type, .010″ thick for pipe 8″ and under, and .016″ thick for 10″ and over. Provide pre-formed aluminum jackets at fittings.

I. T-304 stainless steel jackets shall be corrugated type, with 3/16″ corrugations, .016″ thick for all pipe sizes. T-304 stainless steel jacketing shall have an integrally bonded moisture barrier over the surface in contact with the insulation. Provide two-piece pre-formed T-304 stainless steel at fittings.

J. Staples shall be "outward clinch" or "flare" type.

K. Galvanized steel wire shall be 20 gauge.

L. Stainless steel wire shall be 20 gauge.

2.03 INSULATION PIPE SHIELDS

A. Shields shall be galvanized rolled to form a 180° arc. Length of shields shall conform to the following:

Insulation O.D.	Shield Length	Shield Gauge
0-4″	12″	14 gauge
5-9″	18″	14 gauge
10-19″	24″	12 gauge
Over 20″	30″	12 gauge

2.04 INSULATION DESIGNATION

A. Type D4 shall be Elastomeric Insulation with membrane, suitable for exterior application.

1. Elastomeric sheet and tape shall be a closed cell rubber material with a minimum density of 3.0 lbs./cu.ft. Operating temperature range shall be -70°F to 180°F, with a mean thermal conductivity of 0.27 at 75°F. Material shall have a water vapor permeability not exceeding 0.08 perm-inch and shall resist mildew development. Flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50. Manufacturer shall be Armacell (Armaflex) or Rubatex.
2. Single ply membrane jacket shall be .060″ thick self-adhering rubberized bitumen membrane in the largest sheet possible. The membrane shall conform to the minimum physical properties of ASTM D882, D1000 & E154. Single ply membrane jacket shall be Alumaguard 60 by Polyguard Products or equivalent.

B. Type D6 shall be mineral fiber insulation, suitable for interior application:

1. Mineral fiber shall be asbestos free 6 lb./cu.ft. density wire mesh reinforced mineral wool blanket, semi rigid, with thermal conductivity of not more than 0.24 at 75ºF. Operating temperature range shall be 0°F to 1200°F. Manufacturer shall be Owens Corning.

C. Type D8 shall be Glass Fiber Insulation, low VOC, flexible, suitable for interior application.

1. Insulation shall be composed of one lb./cu.ft. density glass fibers bonded with a thermosetting resin. Operating temperature range shall be 40°F to 250°F. Mean thermal conductivity shall not exceed 0.27 at 75°F. Product shall be certified by Greenguard® for VOC emissions below recommended levels. Manufacturer shall be Certainteed, or Knauf.
2. Insulation finish shall be factory applied foil/scrim reinforced kraft (FSK) jacket with longitudinal flap for butt joint closure. Jacket permeance shall not exceed 0.02 perms.
3. Insulation shall be composed of three lb./cu.ft. density glass fibers bonded with a thermosetting resin. Operating temperature range shall be 0°F to 650°F. Mean thermal conductivity shall not exceed 0.23 at 75°F. Manufacturer shall be Certainteed, Knauf, or Owens Corning.
4. Insulation finish shall be factory applied white all service jacket (ASJ). Jacket permeance shall not exceed 0.02 perms.

D. Type E1 shall be Elastomeric Insulation, suitable for interior application.

1. Elastomeric sheet and tape shall be a closed cell rubber material with a minimum density of 3.0 lbs./cu.ft. Operating temperature range shall be -70°F to 180°F, with a mean thermal conductivity of 0.27 at 75°F. Material shall have a water vapor permeability not exceeding 0.08 perm-inch, and shall resist mildew development. Flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50. Manufacturer shall be Armacell (Armaflex) or Rubatex.

E. Type E2 shall be Glass Fiber Insulation, suitable for interior application.

1. Insulation shall be composed of three lb./cu.ft. density glass fibers bonded with a thermosetting resin. Operating temperature range shall be 0°F to 650°F. Mean thermal conductivity shall not exceed 0.23 at 75°F. Manufacturer shall be Certainteed, Knauf, Owens Corning, or Johns Manville.
2. Insulation finish shall be factory applied all service jacket (white). Jacket permeance shall not exceed 0.02 perms.

F. Type P8 shall be Elastomeric Insulation, suitable for interior application.

1. Elastomeric tube and tape shall be a closed cell rubber material with a minimum density of 3.0 lbs./cu.ft. Operating temperature range shall be -70°F to 180°F, with a mean thermal conductivity of 0.27 at 75°F. Material shall have a water vapor permeability not exceeding 0.08 perm-inch and shall resist mildew development. Flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50. Manufacturer shall be Armacell (Armaflex) or Rubatex.

G. Type P10 shall be Elastomeric Insulation, suitable for exterior application.

1. Insulation shall be same as Type P8.
2. Aluminum jackets shall be corrugated type, .010″ thick for pipe 8″ and under (including refrigerant piping if required), and .016″ thick for 10″ and over. Provide pre-formed aluminum jackets at fittings.

PART 3 – EXECUTION

3.01 GENERAL APPLICATION

A. The following general conditions apply to the insulation installation.

1. Insulation shall be clean and dry during installation and during application of any finish.
2. Provide removable and replaceable covers on all pumps and equipment requiring insulation that must be opened periodically for inspection, cleaning, or repair.
3. Install insulation, jackets, and coatings continuous through wall and floor openings and sleeves. See Section 23 05 00 regarding fire barrier sealing over insulated pipes passing through rated floors and walls.
4. Banding wires shall have the twisted terminals turned down into the insulation, except where vapor barrier would be punctured.
5. Finish open ends of pipe insulation as specified for fittings.
6. All piping, ductwork, and equipment which are scheduled to be insulated shall have a finished jacket, either factory or field applied.
7. Staples shall be installed only on insulation that does not contain a vapor barrier.
8. For all cold piping systems (chilled water, condensate, and domestic cold water), all components of the piping system shall be insulated and provided with a continuous vapor barrier. Vapor barriers shall be continuous for entire piping system and shall not be pierced except as specified otherwise.
9. Factory applied jacket shall be the finish jacket unless otherwise noted.
10. Maintain vapor barrier where dissimilar insulation products abut.
11. Lined ductwork is not required to be insulated externally. Where lined and insulated duct meet duct, liner shall overlap, minimum 4″.
12. Control devices shall be installed on the outside surface of insulation except devices such as firestats. All resulting penetrations and edges of insulation shall be sealed as specified above.
13. No insulation materials shall be in direct contact with supply, return or exhaust airstreams.

3.02 PIPE SHIELDS

A. For all piping, insulation shall be continuous on pipe at pipe hangers with protection shields bearing on the outside of the insulation.

B. For pipes 2″ and larger, where insulation would be crushed by hangers, provide 180° foamed glass inserts between pipe and hanger protector and finish with jacket same as adjacent pipe.

3.03 INSULATION APPLICATION

A. Type D1 and Type D8 – Glass Fiber, flexible Insulation:

1. Blanket insulation shall be installed with not less than 1″ of insulation cut back from the edge of vapor barrier. Vapor barrier shall then overlap the adjacent insulation and vapor barrier at each and every abutting joint. Overlaps shall be sealed with adhesive. In addition, all joints in the vapor barrier such as at hangers and supports shall be sealed with aluminum foil tape.
2. All blanket insulation shall be held in place with 3″ wide adhesive tape at not over 12″ intervals.
3. Where duct greatest dimension is more than 24″ but less than 48″, insulation shall also be tightly wrapped with galvanized wire, 24″ on center. Where duct greatest dimension is more than 48″, 2″ wire mesh shall also be secured to the duct with mechanical fasteners at not more than 2'-0″ center to center in two directions.

B. Type D2, D9, D10 – Glass Fiber, rigid Insulation:

1. All rigid board insulation shall be secured by mechanical fasteners spaced on not more than 18″ centers in two directions. Provide metal corner beading at each corner.
2. Insulation thicknesses specified are minimum values. All projections, duct stiffeners, etc., shall be covered with not less than ½″ thickness of insulation. Surface of insulation shall be smooth without bumps, etc. Vapor seal materials shall pass such obstructions without interruption.

C. Type D4 – Elastomeric Insulation:

1. Same as Type D3. Apply membrane per manufacturer's recommendations.

D. Type D6 – Mineral fiber Insulation:

1. Wrap 16 gauge welded exhaust duct with two layers of insulation. Insulation shall be held in place with welded pins, spaced no more than 16″ on center or a maximum of 4″ from edge of duct. Cover insulation with and 2″ hexagonal wire mesh and support with galvanized bands 18″ on center. Joints shall be staggered and butted together.
2. Completely seal duct penetration at roof with firestop materials per manufacturer's recommendations.
3. Provide access panels in insulation and sheet metal at all range hood duct cleanout locations. Insulate and secure access panel per manufacturer's recommendations.

E. Type E1 – Elastomeric Insulation:

1. Foamed plastic insulation shall be cut into shaped sections and applied over 100% surface coverage of adhesive. Insulation shall be applied when surface is clean and dry. Butt joints together in a staggered fashion and butter with adhesive before joining to provide a continuous vapor barrier jacket. Install insulation with the skin side outside.

F. Type E2 – Glass Fiber, rigid Insulation:

1. All rigid board insulation shall be secured by mechanical fasteners spaced on not more than 18″ centers in two directions.
2. Insulation thicknesses specified are minimum values. All projections shall be covered with not less than ½″ thickness of insulation. Surface of insulation shall be smooth without bumps, etc. Vapor seal materials shall pass such obstructions without interruption.

G. Type P8 - Elastomeric Insulation:

1. Slip piping insulation on before joints are made up. Butt joints together and seal with manufacturer's adhesive.
2. Insulate fittings and valves with miter cut pieces of insulation the same thickness as the piping insulation.

H. Type P10 - Elastomeric Insulation:

1. Same as Type P8. Aluminum jacket shall be installed with the seam on the underside of the pipe. Aluminum bands shall be installed at each joint and at the midpoint of each jacket section. Waterproof fabric and mastic as specified above shall be used on fittings.

3.04 FINISH JACKETS

A. Field installed jackets shall be provided when specifically noted.

B. Pre-sized glass cloth jackets shall be secured by a continuous coating of adhesive applied to a uniform thickness. Jacket shall be smooth without wrinkles. Jacket shall be applied to straight lengths of covering only.

C. Flexible glass cloth shall be applied to equipment, valves, fittings, and curved surfaces. Cloth tape shall be smoothly applied and secured with a continuous coat of adhesive. White fabric and mastic to be used on exposed pipe fittings. Tape shall overlap itself and adjacent jackets not less than 2″.

END OF SECTION 23 07 00

SECTION 23 09 23
BUILDING AUTOMATION AND TEMPERATURE CONTROL SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements of the Building Automation and Temperature Control System (BAS). The BAS shall utilize direct digital control (DDC) technology to maintain the space conditions and provide automatic control of the associated mechanical equipment.

1.02 SCOPE OF WORK

A. Furnish and install a complete building automation system in all respects, including any and all equipment, wiring, instrumentation, enclosures, labor, engineering, coordination with other trades, etc. No information given in these specifications shall relieve the contractor of this absolute requirement. Include all associated electrical work. It is the intent of these specifications that the Contractor shall furnish and install the systems complete in every respect and ready to operate. Furnish and install equipment, miscellaneous items, and accessories required for the correct and convenient operation of the entire installation, whether or not such item is shown on the plan or mentioned herein.

B. Work Included:

1. System engineering and design documents.
2. Pre-assembled control panels.
3. System programming.
4. Actuators, thermostats, sensors, thermowells, and mounting hardware as applicable.
5. Control valves, control dampers, linkages, and mounting hardware.
6. Construction supervision.
7. Start-up and system check out.
8. Demonstration and training.
9. Warranty.

1.03 RELATED SECTIONS

A. Section 23 05 00 Common Work Results for HVAC

B. Section 23 64 28 Air Cooled Package Chiller

C. Section 23 74 15 Unitary Air Conditioning Units

1.04 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Drawings:

1. Prepare instrumentation and control diagrams labeled accurately and showing the system architecture and the interrelationship of all controls and the areas and equipment served. Clearly show point-to-point connections.

2. Wiring diagram shall delineate between power and control wiring and shall indicate all starters, contactors, relays, sensors, and other components of the system. Normally open positions for valves, dampers, and relays shall be indicated. All wiring between equipment, modules, and control panels shall be shown. A ladder diagram detailing control functions shall be included.
3. Separate pneumatic piping diagram shall indicate all starters, contactors, relays, sensors, and other components of the system. Normally open positions for valves, dampers, and relays shall be indicated. A ladder diagram detailing control functions shall be included.

C. Submit the above diagrams as post construction control record drawings derived from redlined prints maintained during construction by this Contractor.

D. One (1) copy of the control record drawing shall be secured to the associated control panel. Mounting diagram(s) in a resealable plastic pouch is acceptable.

E. Submit shop drawings and manufacturer's data for the following:

1. Sensors.
2. Controllers and set points.
3. Actuators.
4. Automatic control valve and damper schedules.
5. Points List.
6. Thermostats.
7. Thermometers and indicators.
8. System diagrams, including system architecture.
9. Point-to-point wiring or tubing diagrams.
10. Control panels and panel layout.
11. Installation and calibration instructions.
12. Software programs and sequences written in the program language and in English.
13. Control air compressors.

F. Operating and Maintenance Data (after construction):

1. Submission: Submit three (3) 8½″ x 11″, 3-ring, hard cover, bound and typed copies of Operating and Maintenance Manual to the Architect for approval prior scheduling any systems demonstration for the Owner.
2. Required Contents: Typed index with tab dividers for each major equipment section to facilitate locating information on specific pieces of equipment. Identify data within each section with drawing code numbers as they appear on Drawings and Specifications. Include as a minimum the following data:

    a. Alphabetical list of system components with the name, address, and 24-hour telephone number of the company responsible for servicing each item during the first one year of operation.
    b. Operating instructions for each piece of equipment and the complete system including:

        1) Emergency procedures for fire or failure.
        2) Start, operation, maintenance, disassembly, and shutdown procedures.
        3) Maintenance instructions for each piece of equipment.
        4) Valve tags and other identified equipment lists.
        5) Proper lubricants and lubricating instructions.
        6) Cleaning, replacement and/or adjustment schedule.
        7) Product data on each piece of equipment.
        8) Installation instructions.
        9) Manufacturer's shop drawings and specifications.
        10) Parts list.

11) Wiring and temperature control diagrams “as-built” as detailed above.

1.05 QUALITY ASSURANCE

A. Control installation work shall be performed by mechanics regularly employed in the installation of the control manufacturer. Control work shall be by Automated Logic Controls (ALC), Johnson Controls, Control Concepts, or Siemens.

1.06 WARRANTY

A. Provide a one (1) year labor and material warranty from date of system acceptance by Owner. Warranty shall cover hardware, software, and programming. The contractor shall correct any work found defective or not in accordance with the contract documents.

B. The contractor shall provide all maintenance including parts, labor, and expenses for correction of any deficiency, breakdown, and routine preventative maintenance for the one (1) year warranty period.

C. Provide written guarantee the system will be upwardly compatible for at least five (5) years without requiring wholesale replacement of hardware to upgrade to new generations. Failure to provide guarantee will result in immediate rejection of bid and proposal.

D. Components: All system components shall be approved and listed by Underwriters Laboratories under UL916 for Direct Digital Control systems, and FCC-Part 15, Subparagraph J, Class A Emissions Requirements.

PART 2 – PRODUCTS

2.01 SENSING/CONTROL FIELD DEVICES

A. Field devices include all sensors, wells, relays, pressure switches, control valves, valve actuators, dampers, damper actuators, and other interfaces necessary for connecting the DDC panels to the facility equipment to be controlled under this specification.

B. Analog Electronic Transmitters:

Limit of error:	± 0.50% of span
Deviation from Linearity	± 0.50% of span
Hysteresis	± 0.10 % of span
Deadband	± 0.10% of span
Frequency Response	3 db at 10Hz
Variations due to temp. change	± 0.01% of span °F
Variations due to voltage change	0.05% of span per volt
Ambient limits:	-20°F to 130°F

C. I/P Converters:

Input signal	4-20mA
Output signal	3 to 15 psig
Accuracy	± 0.75% of span
Linearity	± 0.50% of span

Hysteresis	± 0.50% of span
Deadband	± 0.10% of span

D. Rate/Reset Controllers: Use proportional type with adjustable integral and derivative actions. The controllers shall be field adjustable and provide a switch to eliminate the integral and derivative functions for calibration.

E. Communications Ports: Provide all sensors and controllers with RS-232 serial communications port for the control network communication.

2.02 ELECTRONIC DEVICES FOR AIR HANDLING SYSTEMS

A. Firestats shall be manual reset type, set for 125°F.

B. Smoke Detectors: Specified to be furnished under Division 26 and mounted by Division 23. This Contractor shall install smoke detectors for HVAC systems where called for in sequence of operation, installed per NFPA, IBC, and/or local codes.

C. Temperature sensors shall be Platinum, 1000 ohms nickel iron or RTDs, accurate to ±0.1% at 0°C.

D. Space (room) temperature sensors shall be surface mounted in decorator style non-vented plastic covers. Sensors shall have a tamper resistant cover with manual occupant adjustment to permit a ±3° deviation from the stored setpoint. Delete manual adjustment in non-occupied applications. Minimum range shall be 50°F to 95°F. Sensor shall have an override button and green LED light to indicate when system is in the "Occupied" mode.

E. Duct temperature sensors shall be of the averaging type to cover the entire duct cross-section. Element casing shall be copper. Minimum range shall be 32°F to 110°F. Provide capillary mounting clips as required.

F. Outdoor air temperature sensors shall be mounted in weatherproof box and protected by a ventilated sun shield that covers the sensor on all sides but below. Minimum range shall be -30°F to 200°F.

G. Space (room) humidity transmitters shall be surface mounted in decorator style non-vented plastic covers. Sensors shall utilize resistance change of bulk polymer with ±2% RH accuracy at 77°F and temperature compensation. Minimum range shall be 0-100% RH.

H. Outdoor Humidity Transmitters shall be mounted in a weatherproof box and protected by a ventilated sunshield which covers the sensor on all sides but below. Sensor shall utilize resistance change of bulk polymer with ±2% RH accuracy at 77°F and temperature compensation. Minimum range shall be 0-100% RH.

I. Static air pressure transducers shall measure the differential pressure between the high and low ports on the transducer. They shall be accurate to within plus or minus one (1) percent of full scale and be capable of withstanding a momentary pressure of up to eight (8) times the rated pressure, or 8″ W.G. whichever is greater without damage. The diaphragm shall be rated for use with air, between 32°F and 125°F.

J. Outside airflow measuring system shall be Model GT-116 (duct) or GT-116F (fan inlet) manufactured by Ebtron or pre-approved equal. System shall consist of duct-mounted probe with heated flow sensing thermistors and temperature sensors inside aluminum 6063T2 casing. Each airflow station shall include an electronic (24VDC) microprocessor within a duct-mounted enclosure. The OSA temperature and velocity shall be output as a 4-20mA signal. Sensor accuracy shall be ±2% of velocity reading. Manufacturer to verify quantity of probes required in each application. Install airflow sensor per manufacturer's recommendations.

K. Electric low-limit temperature detection thermostats shall be provided for each AHU chilled water, heating or preheat coil section. The thermostat shall be UL-listed, vapor pressure type and shall have a DPDT contact block which will open a circuit upon a drop in temperature. A minimum 20′ long element shall sense the air temperature and shall cause the switch to operate if one (1) foot or more is subject to temperatures below 38°F. The device shall be manually reset unless indicated otherwise. Provide multiple low limit thermostats as required to cover the entire coil face area.

L. All automatic fluid flow control valves shall be fully proportional with modulating plugs for equal percentage or linear flow characteristics. Valve trim shall be suitable for chilled water, hot water, or steam service. The valve stem assembly shall be fashioned from high grade stainless steel. The automatic control valve shall be sized by the control manufacturer for the appropriate pressure drop, but no greater than 3 psi, to ensure proper throttling performance at all system loads. Provide 2-way or 3-way valves as shown on the equipment schedule or drawings. The valve body and actuator shall be sufficient to handle system pressure and shall close against the differential pressures liable to be encountered in the system. Body pressure rating and connection type construction shall be suitable for the service:

M. Ball valves ½″ through 2″ shall be constructed with a cast brass body and screwed end.

N. Vee-Ball valves 2″ through 4″ shall be constructed with a steel body and flanged or screwed connections.

O. Butterfly valves 6″ and above shall be constructed with a cast iron body and have flanged connections.

P. Trim shall consist of a removable cage providing valve plug guiding throughout the entire travel range. A stainless steel stem shall be provided. Bonnet, cage, stem, and the plug assembly shall be removable for servicing.

2.03 ELECTRONIC DEVICES FOR HYDRONIC AND/OR GASEOUS SYSTEMS

A. Temperature Transmitters shall have elements suitable for immersion into tanks and piping and have platinum RTD for use with bridge circuit controllers or transmitters. Sensors to be single, dual, averaging, dual wound or suitable to maintain stable control. Provide stainless steel immersion wells with heat conducting compound in tanks and piping. Minimum range shall be -30°F to 240°F.

B. Differential Pressure Switch: Rate for 120V, 60Hz single-phase power. Provide switches equipped with adjustable setpoint, dust-tight enclosures and snap-acting contacts, housed in a NEMA 4 enclosure.

C. Differential Pressure Transmitters shall be stainless steel with ceramic capacitive sensing element with temperature compensation. Sensor shall have overpressure rating three times the sensing range, 3,000 psi burst pressure, and housed in a splash-proof enclosure with gauge. Minimum range shall be 15 to 75 psi or 100 to 500 psi, as best meets system operation.

D. Pressure Transmitters: Provide an electronic device with pressure ranges from –30″ Hg to 400 psig that generates a 4 – 20 ma signal, suitable for gaseous or water applications. Device shall be housed in a watertight polystyrene enclosure. Device shall be suitable for temperature ranges of –12°F to 167°F. Device shall be provided with a pressure gauge in a corresponding pressure range.

E. Stainless Steel Pressure Transmitter: Provide a stainless steel pressure transmitter with ranges from –30" Hg to 2000 psi, made of 304 stainless, suitable operating range from -40°F to 200°F, compatible with gases or liquids. Output will be 4-20 ma with 10-30 VDC supply voltage at 25 ma.

F. Water Flow Switches: Provide stainless steel or bronze paddle switches. For chilled water, provide vapor-proof type to prevent condensation in the electrical switch. Provide pressure-flow switches of below-actuated mercury or snap-acting type with appropriate scale range and differential adjustment for service indicated.

G. Water Flow Transmitters shall be turbine in-stream type with nickel-plated brass wetted components, electronic impedance sensing and 2% accuracy manufactured by Onicon. Device shall be fitted with hot tap adapter and proper stem length. Minimum range shall be 30° to 180°F.

H. Liquid Level Transmitter: Provide electronic probe-type level control and monitoring sensor. Level sensors shall provide analog signal monitoring of tank liquid level.

I. Condenser Water Conductivity Transmitter: Provide a sensor with a calibration range of 0 to 5,000 microns, 120V 60Hz, 2″ MNPT pipe connection, 35°F to 100°F operating range.

J. pH Transmitter: Provide a sensor with a range of 2 to 12pH, 120V 60Hz, 1″ MNPT pipe connection, 35°F to 100°F operating range.

2.04 CONTROL DAMPERS

A. Control dampers shall be multi-blade opposed-action type. Frames shall be formed 16-gauge galvanized steel channel with corner braces above size 20″ wide and 20″ high. Maximum individual damper width shall not exceed 48″. Blades shall be 6″ (maximum) wide, constructed of 16 U.S. Gauge (minimum thickness) formed galvanized steel attached to cold-rolled galvanized steel axles. Axle bearings shall be self-lubricating nylon or Teflon. Damper shall be controlled by factory assembled operating linkages concealed in the frame outside of airstream, constructed of galvanized steel. Individual actuators shall serve a maximum of 30 square feet of damper area. Provide additional actuators for larger areas. Ruskin CD35 or equal by Arrow United, Cesco, Greenheck, or National Controlled Air.

B. Dampers opening to outdoors shall be provided with jamb seals and blade seals. Seals shall be provided for all control dampers with rated operating range from -40°F to 180°F. Jamb seals shall be stainless steel and blade seals shall be compressible neoprene, PVC-coated polyester fabric, synthetic elastomer, or extruded vinyl. Blade seals shall be replaceable. Leakage rate for dampers opening to outdoors shall not exceed 11 CFM per sq. ft. at 1″ static pressure when measured in a 48″ x 48″ size. Leakage rate shall be AMCA certified. Ruskin CD36 or equal by Arrow United, Cesco, Greenheck, or National Controlled Air.

C. Motorized Control Dampers to be installed by the mechanical contractor.

2.05 CONTROL DAMPERS (AIRFOIL TYPE – OPPOSED ACTION)

A. Control dampers shall be multi-blade, opposed action, airfoil type. Frames shall be formed 16-gauge galvanized steel channel with corner braces. Maximum individual damper width shall not exceed 60". Blades shall be double skin airfoil type, 6″ (maximum) wide, constructed of 16 U.S. Gauge (minimum thickness) formed galvanized steel attached to cold-rolled galvanized steel axles. Axle bearings shall be self-lubricating nylon or Teflon. Damper shall be controlled by factory assembled operating linkages concealed in the frame outside of airstream, constructed of galvanized steel. Jamb seals shall be stainless steel and blade seals shall be compressible neoprene, synthetic elastomer or extruded vinyl. Blade seals shall be replaceable. Leakage rate shall be AMCA certified. Individual actuators shall serve a maximum of 30 square feet of damper area. Provide additional actuators for larger areas. Dampers shall be powered closed and foil-open. Ruskin CD60 or equal by Arrow United, Cesco, Greenheck, or National Controlled Air.

B. Motorized Control Dampers to be installed by the mechanical contractor.

2.06 CONTROL DAMPERS (AIRFOIL TYPE – PARALLEL BLADE ACTION)

A. Control dampers shall be parallel blade action airfoil type. Frames shall be formed 16-gauge galvanized steel channel with corner braces. Maximum individual damper width shall not exceed 60". Blades shall be double skin airfoil type, 6″ (maximum) wide, constructed of 16 U.S. Gauge (minimum thickness) formed galvanized steel attached to cold-rolled galvanized steel axles. Axle bearings shall be self-lubricating nylon or Teflon. Damper shall be controlled by factory assembled operating linkages concealed in the frame outside of airstream, constructed of galvanized steel. Jamb seals shall be stainless steel and blade seals shall be compressible neoprene, synthetic elastomer or extruded vinyl. Blade seals shall be replaceable. Leakage rate shall be AMCA certified. Individual actuators shall serve a maximum of 30 square feet of damper area. Provide additional actuators for larger areas. Dampers shall be powered closed and foil-open. Ruskin CD60 or equal by Arrow United, Cesco, Greenheck, or National Controlled Air.

B. Motorized Control Dampers to be installed by the mechanical contractor.

2.07 UTILITY METERING

A. Chilled Water/Hot Water Btu Meter: The Onicon System-10 Btu meter with the F-3500 series insertion electromagnetic flow meter will be used for Btu metering. The flow meter and temperature sensors will be installed using hot tap connections. Upstream and downstream straight pipe lengths for the flow meter installation shall comply with manufacturer recommendations.

B. Steam Metering:

1. Steam meter shall be an insertion-type, vortex-type meter with integral detector, indicator, and remote converter. Converter shall be mounted no higher than five feet above finished floor.
2. Design pressure and temperature ratings of system components shall be for a minimum working pressure of 150 psig steam at 366°F. Wetted Parts shall be all stainless steel. Meter shall be installed in a horizontal section of piping between a pair of welding neck flanges.
3. Accuracy shall be a minimum of ±2% of reading and shall b factory-calibrated.
4. Output shall be a pulse rate of not less than one pulse per pound of steam. Output Signal shall be 4 to 20 mAmp.
5. Self-diagnostics and Alarm Output: In the event of an abnormal condition, a binary alarm signal output shall be provided by the steam flow meter system.
6. Steam flow meter shall be Yokogawa Vortex meter or equivalent.

C. Domestic Water Metering:

1. Water meters sized less than 2.5″ will be positive displacement style. Larger water meters will be turbine or turbo style. All water meters will be installed per manufacturer recommendations. All water meters to be installed inside a building will be supplied with an index capable of providing a dry contact closure pulse for monitoring water consumption. All water meters to be installed in the ground will be provided with an index that can be read with a touch pad style reader. Consult the Emory Utility Engineer for specifying the meter index.
2. Cooling tower makeup water meters will be turbine style meters.
3. Acceptable water meter manufacturers are Sensus, Master Meter, and Neptune.

D. HVAC Make-Up Water Metering:

1. Include Water meters for chilled water make-up, heating hot water make-up, cooling tower make-up, and cooling tower blow-down.
2. Make-up water flow meters on chilled water and heating hot water systems (closed loops) shall be a positive displacement type by Neptune or equivalent.

E. Utility Metering Integration to the DDC Control System:

1. Steam and chilled water meters will be connected to DDC Control System programmed to totalize kilo-lbs. of steam and kilo-ton-hrs. of chilled water.
2. Metering data will be added to the appropriate display pages in the DDC Control System. Metering data displayed includes totalized kilo-lbs. and kilo-ton-hrs., current lb./hr. of steam, chilled water flow, chilled water temperatures, and chilled water tons.

F. Electric Metering:

1. See Electric Division for meter type, location, and interface requirements.
2. DDC shall monitor electric meters and convert to usage as directed by the Owner.

2.08 MISCELLANEOUS ELECTRONIC DEVICES

A. Current switches shall be solid state switch with adjustable setpoint (set at no load condition for fan or pump run status). Switch capacity shall be selected based on motor monitored.

B. Electric actuators shall either be push-pull magnetic or hydraulic type, or rotary (gear-train) type for two-position or modulating service as required by application. All electric actuators shall be UL listed with NEMA 1 enclosures, unless otherwise acceptable.

1. Thermally powered (heat motor) actuators are not acceptable.
2. Actuators shall fail to the position as indicated on the drawings.
3. Actuators shall be permanently lubricated; gear-train units shall be oil-immersed type. Actuator housings shall be metal or plastic. Ambient temperature range shall be at least 40°F to 120°F, except actuators subjected to outdoor ambients shall have ambient range of -20°F to 130°F minimum. Actuator size and rating shall be suitable for intended application.
4. Modulating magnetic or electric actuators with adjustable end switches to prevent overstroking are acceptable in sizes $\leq 1''$.
5. Positive positioners shall be provided on actuators for AHU's control, to provide smooth modulation or proper sequencing:

    a. Positioner start-point shall be adjustable (or selectable).
    b. Positioner span shall be adjustable, or at least three fixed spans for sequencing applications shall be available.

C. Control Relays: Interposing control relays shall be rated for the application, have a minimum of two (2) sets of Form C contacts, and be enclosed in a dustproof enclosure. The coils shall be equipped with transient suppression devices to limit transients.

D. Emergency Fan Stop Switch: Provide a recessed, normally closed glass break pull station permanently marked “EMERGENCY FAN STOP SWITCH” where shown.

E. Water detector shall use gold-plated probes mounted in an adjustable height watertight enclosure with N.O. and N.C. contacts.

F. Pneumatic actuators shall be diaphragm or piston type, sized to control the drive apparatus. Modulating valve and damper motors in control sequences of more than two (2) stages shall be provided with positive positioning device, also in two (2) stage sequences where motors are operating at 75% or more of their rated capacity. Positions shall be capable of applying maximum motor effort to maintain the operator position called for by its related controller.

G. P.E. switches to be dust free sealed type, mercury or micro with high and low limits independently adjustable over the entire range.

2.09 CONTROL AIR SUPPLY

A. A control air supply system shall be furnished to provide clean, dry, control quality instrument air to the temperature control system.

B. A duplex air compressor shall be installed as indicated on the plans. Each air compressor shall be sized by the temperature control manufacturer to provide adequate air for the system without operating more than 33% of the time. Air compressor and aftercooler sizing shown on the plans shall represent minimums only. The air compressor shall be of the instrument air quality type, operating at low piston speeds and low temperature to minimize oil vaporization and carryover.

C. A receiver tank shall be furnished complete with ASME label, pressure gauge, relief valve, automatic drain trap piped to convenient drain, and all necessary openings. The compressor receiver tank shall be sized to require no more than 10 starts per hour of an individual compressor. The receiver tank shall comply with applicable state and local codes as well as OSHA standards.

D. The control air supply package shall be furnished complete with the following accessories:

1. A dryer shall be furnished to remove contaminants from the air, such as oil and water.
2. The aftercooler dryer shall be of the mechanical refrigeration type rated not less than 1/6 HP with a refrigeration capacity to assure a dewpoint of 39°F for 10 cfm of air at 100 psi, with inlet air of 100°F, operating at 100°F ambient temperature.
3. Dryer shall be provided for full system capacity.

E. The assembly shall include the following:

1. Integral 40 micron particulate after filter.
2. Automatic condensate drain trap.
3. “Power On” green pilot light.
4. “High Air Temperature” red warning pilot light.
5. Provision for connection of a remote alarm.
6. A 24-hour blowdown timer on the receiver tank positioned to automatically open a solenoid valve for an adjustable 4 to 30 seconds once a day.

7. Submicron filter assembly, including replaceable cartridge type filter with transparent bowl and metal bowl guard. Filter element shall be effective in removing 98% of any oil leaving the aftercooler and solid particles as small as 0.6 microns. A trap shall be provided to automatically discharge any liquid contaminants retained in the filter bowl.
8. Pressure reducing stations shall be provided at locations to ensure adequate quantity and pressure of instrument air to all controls furnished herein. A pressure gauge shall indicate the output of the PRV. For systems operating at 20 psig, a pop safety shall be furnished to protect instruments from excess air pressures.

F. An electric alternator package shall be furnished that will:

1. Alternate the lead/lag compressor on each start.
2. Energize the lag compressor in the event that the lead compressor either fails to start or fails to deliver sufficient air capacity.
3. The alternator system shall include combination starters or fused disconnect starters as indicated on the plans.

2.10 AIR PIPING

A. Piping shall be seamless copper tubing with sweat fittings or non-metallic tubing with barbed brass fittings. Piping shall be concealed except in mechanical rooms. Exposed non-metallic tubing and tubing associated with life safety devices shall be run in conduit. Main air supply shall be routed vertically in the rated electrical chase and shall be copper tubing. Lateral runs of main air from the riser to each fan room shall be copper tubing.

B. Fasten exposed copper tubing with copper clips at regular intervals and run parallel to building lines. Attach concealed tubing above suspended ceilings to structure or ductwork. Bends shall be tool made. Provide unions at final connections to apparatus. Insulate copper tubing from galvanized metal with plastic or sheet lead.

C. Non-metallic tubing shall be Dekoron 1219 FR fire retardant, black, number coded polyethylene. Make connections to hot equipment and hot water valves with copper. Tubing installed inside control panels and equipment enclosures shall be tied and supported. All non-metallic tubing serving life safety function shall be run in conduit.

D. Gauges shall be installed on each air line connecting to each controlling and controlled device, except room thermostats.

2.11 CONTROL PANELS

A. All controllers, relays, switches, etc., for equipment located within equipment rooms shall be mounted in enclosed control panels with hinged locking doors. Indicating devices and switches shall be mounted on the face of the control panel door. All control devices, including indicators, for equipment located in exposed areas subject to outside weather conditions, shall be mounted inside weatherproof enclosures. Location of each panel is to be convenient for adjustment service. Name plates shall be provided beneath each panel-mounted control device describing the function of the device.

B. All electrical devices within the panel shall be prewired to terminal strips with all inter-device wiring within the panel completed prior to installation of the system.

C. All enclosures shall be fully enclosed cabinets with 12-gauge, furniture steel construction with baked enamel finish and hinged key door locks and shall have removable face and back panels. Panels shall be Underwriters Laboratories, Inc. listed for line voltage applications.

D. All panels will be documented with schematics, parts layout, parts listing, component and board identifiers consistent on all documentation, theory of operation and service manuals.

E. Mount panels adjacent to associated equipment on vibration free walls or free standing steel angle supports.

2.12 GENERAL PRODUCT DESCRIPTION

A. The Building Automation System shall be capable of integrating multiple building functions including equipment supervision and control, alarm management, energy management, fire management, lighting control, information management, and historical data collection and archiving.

B. The facility management system shall consist of the following:

1. Standalone DDC panels.
2. Application specific controllers (ASPs).
3. Remote Display Devices.
4. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, standalone DDC panels, and operator devices.
5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
6. Standalone DDC panels shall be able to access any data from, or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device, such as a central file server.

2.13 NETWORKING/COMMUNICATIONS (LOCAL NETWORK)

The design of the BAS shall be networked. Inherent in the system's design shall be the ability to expand or modify the network via a local network.

A. Local Network:

1. Personal Computer/Panel Support: The Personal Computer or Digital Panel shall directly oversee a local network such that communications may be executed directly to and between ASCs. The Personal Computer version and Digital Panel version shall be referred to as the "Digital Panel(s)" throughout this document.
2. Data Access: All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data on the network. Access to system data shall not be restricted by the hardware configuration of the facility management system.

3. Global Data Sharing: Global Data Sharing or Global point broadcasting shall allow point data to be shared between ASCs, when it would be inefficient or impractical to locate multiple sensors.
4. General Network Design: Network design shall include the following provisions:

    a. Data transfer rates for alarm reporting and quick point status from multiple ASCs. The minimum baud rate shall be 9600 baud.
    b. Support of any combination of ASCs. A minimum of 100 ASCs shall be supported on a single local network. The bus shall be addressable for up to 255 ASCs.
    c. Detection of single or multiple failures of ASCs or the network media.
    d. Error detection, correction, and retransmission to guarantee data integrity.
    e. Commonly available, multiple-sourced, networking components shall be used.

f. Use of an industry standard protocol, such as Optomux, and IEEE RS-485 communications interface.

2.14 NETWORKING/COMMUNICATIONS (LOCAL AREA NETWORK)

The design of the BAS shall network operator workstations and Standalone DDC panels. Inherent in the system's design shall be the ability to expand or modify the network.

A. Local Area Network:

1. Panel Support: DDC panels shall directly reside on a single shared high speed local area network such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations on a peer-to-peer basis.
2. Dynamic Data Access: All operator devices, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment.
3. Access to system data shall not be restricted by the hardware configuration of the facility management system. The hardware configuration of the FMS network shall be transparent to the user when accessing data or developing control programs.
4. General Network Design: Network design shall include the following provisions:

    a. High speed data transfer rates for alarm reporting, quick report generation from multiple controllers, and upload/download efficiency between network devices. The minimum baud rate shall be 1 Megabaud.
    b. Support of any combination of controllers and Operator Workstations directly connected to the local area network.
    c. Detection and accommodation of single or multiple failures of either workstations, DDC panels or the network media. The network shall include provisions for automatically re-configuring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.
    d. Message and alarm buffering to prevent information from being lost.
    e. Error detection, correction, and re-transmission to guarantee data integrity.
    f. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.
    g. Commonly available, multiple sourced, networking components shall be used to allow the FMS to coexist with other networking applications. The following are acceptable technologies: ETHERNET.

2.15 DDC PANELS

A. General: Digital Panels shall be microprocessor-based, multi-tasking, multi-user, digital control processors.

B. Memory: Each Digital Panel shall have sufficient memory to support its own operating system and data bases including:

1. Control processes.
2. Energy Management Applications.
3. Alarm Management.
4. Trend Data.
5. Maintenance Support Applications.
6. Operator I/O.
7. Dial-Up Communications.

8. Manual Override Monitoring.

C. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of field controllers, sensors, and actuators.

D. Serial Communication Parts: Digital Panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices, such as laptop computers, Personal Computers, and Video Display terminals.

E. Hardware Override Monitoring: Digital Panels shall monitor the status of all overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited.

F. Integrated On-Line Diagnostics: Each Digital Panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment. Digital Panels shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each Digital Panel.

G. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations, to suppress induced voltage transients. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of the Digital Panel to prevent the loss of data base or operating system software:

1. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
2. Upon restoration of normal power, the Digital Panel shall automatically resume full operation without manual intervention.

2.16 STANDALONE DDC PANELS

A. General: Standalone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each standalone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification and the attached point list.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:

1. Control Processes.
2. Energy Management Applications.
3. Alarm Management.
4. Historical/Trend Data for all points.
5. Maintenance Support Applications.
6. Custom Processes.
7. Operator I/O.
8. Dial-Up Communications.
9. Manual Override Monitoring.

C. Point types: Each DDC panel shall support the following types of point inputs and outputs:

1. Digital Inputs for status/alarm contacts.
2. Digital Outputs for on/off equipment control
3. Analog Inputs for temperature, pressure, humidity, flow and position measurements
4. Analog Outputs for valve and damper position control, and capacity control of primary equipment
5. Pulse Inputs for pulsed contact monitoring

D. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators. The system architecture shall support 25% expansion capacity of all types of DDC panels, and all point types included in the initial installation.

E. Serial Communication Ports: Standalone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel mounted or portable DDC panel Operator's Terminals. Standalone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

F. Hardware Override Switches: As indicated in the point schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC panel via local, point discrete, onboard hand/off/auto operator override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.

G. Hardware Override Monitoring: DDC panels shall monitor the status or position of all overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. DDC panels shall also collect override activity information for daily and monthly reports.

H. Local Status Indicator Lamps: The DDC panel shall provide local status indication for each binary input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

I. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of subsidiary equipment. The DDC panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each DDC panel and shall not require the connection of an operator I/O device.

J. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients.

K. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-Volatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention. Should DDC panel memory be lost for any reason, the panel will automatically receive a download via the local area network, phone lines, or connected computer. In addition, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-232C port, or via telephone line dial-in.

2.17 SYSTEM SOFTWARE FEATURES

A. General:

1. All necessary software to form a complete operating system, as described in this specification, shall be provided.
2. The software programs specified in this section shall be provided as an integral part of the Digital Panel and shall not be dependent upon any higher-level computer for execution.

B. Control Software Description:

1. Equipment Cycling Protection: Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.
2. Heavy Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

C. Energy Management Applications: Digital Panels shall have the ability to perform any or all of the following energy management routines:

1. Time of Day Scheduling.
2. Calendar Based Scheduling.
3. Holiday Scheduling.
4. Optimal Start.
5. Optimal Stop.
6. Demand Limiting.
7. Load Rolling.
8. Heating/Cooling Interlock.

D. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow user customization. Programs shall be applied to building equipment described in the "Execution" portion of this specification.

E. Programming Capability: Digital Panels shall be able to execute configured processes defined by the user to automatically perform calculations and control routines.

F. Process Inputs and Variables: It shall be possible to use any of the following in a configured process:

1. Any system-measured point data or status.
2. Any calculated data.
3. Any results from other processes.
4. Boolean logic operators (and, or).

G. Process Triggers: Configured processes may be triggered based on any combination of the following:

1. Time of day.
2. Calendar date.
3. Other processes.
4. Events (e.g., point alarms).

H. Data Access: A single process shall be able to incorporate measured or calculated data from any and all other ASCs. In addition, a single process shall be able to issue commands to points in any and all other ASCs on the local network.

I. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each Digital Panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the Digital Panel's ability to report alarms be affected by either operator activity at the local I/O device, or communications with other ASCs on the network:

J. Point Change Report Description: All alarm or point change reports shall include the points' English language description, and the time and date of occurrence.

K. Prioritizing: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define conditions under which point changes need to be acknowledged by an operator, and/or logged for analysis at a later date.

L. Report Routing: Alarm reports and messages shall be directed to an operator device.

M. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 60-character alarm message to more fully describe the alarm condition or direct operator response. Each Digital Panel shall be capable of storing a library of at least 100 Alarm Messages. Each message may be assignable to any number of points in the panel.

N. Auto-Dial Alarm Management: In Dial-up applications, only critical alarms shall initiate a call to a remote operator device. In all other cases, call activity shall be minimized by time-stamping and saving reports until a manual request is received, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.

O. Trend Analysis: A data collection utility shall be provided to automatically sample, store, and display system data. Measured and calculated analog and binary data shall be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 1 minute to 24 hours, in one-minute or one-hour intervals, shall be provided. Each Digital Panel shall have a dedicated buffer for tend data, and shall be capable of storing 16 trend logs. Each trend log shall have up to four points trended at 48 data samples each. Data shall be sorted at the Digital Panel, and uploaded to floppy disk storage when archival is desired.

P. Runtime Totalization: Digital Panels shall automatically accumulate and store runtime hours for binary input and output points specified in the "Execution" portion of this specification.

1. The Totalization routine shall have a sampling resolution of one minute.
2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.

Q. Pulse Totalization: Digital Panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points:

1. Totalization shall provide calculation and storage accumulations of up to 9,999,999 units (e.g. KWH, gallons, KBtu, tons, etc.).
2. The Totalization routine shall have a sampling resolution of one minute.
3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

4. The information available from the Pulse Totalization shall include, but not be limited to, the following:

    a. Peak Demand, with date and time stamp.
    b. 24-hour Demand Log.
    c. Accumulated KWH for day.
    d. Sunday through Saturday KWH usage.
    e. Sunday through Saturday Demand KW.
    f. Demand KW annual history for past 12 periods.
    g. KWH annual history for past 12 periods.

R. Event Totalization: Digital Panels shall have the ability to count events, such as the number of times a pump or fan system is cycled on and off:

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.
2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

2.18 APPLICATION SPECIFIC CONTROLLERS

A. Each Digital Panel shall be able to extend its monitoring and control through the use of standalone Application Specific Controllers (ASCs).

B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and databases including:

1. Control Processes.
2. Energy Management Applications.
3. Operator I/O (Portable Service Terminal).

D. The operator interface to any ASC point data or programs shall be through the Digital Panel or portable operator's terminal connected to any ASC on the network.

E. ASCs shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures.
2. Display status.
3. Display setpoints.
4. Display control parameters.
5. Override binary output control.
6. Override analog setpoints.
7. Modification of gain and offset constants.

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

G. Application Descriptions:

1. VAV Terminal Controllers:

a. VAV Terminal Unit Controllers shall support, but not be limited to, the control of the following configurations of VAV boxes to address current requirements described in the "Execution" portion of this specification, and for future expansion:

1) Single Duct Only (Cooling Only, or Cooling with Reheat).
2) Fan Powered (Parallel/Side Pocket, Series/On-Off Logic, Series/Proportional Fan).

b. VAV Terminal Unit Controllers shall support the following types of point inputs and outputs:

1) Proportional Cooling Outputs.
2) Box and Baseboard Heating Outputs (Proportional, or 1 to 3 Stages).
3) Fan Control Output (On/Off Logic, or Proportional Series Fan Logic)

c. VAV Terminal Unit Controllers shall support the following library of control strategies to address the requirements of the sequences described in the "Execution" portion of this specification, and for future expansion:

1) Daily Schedules.
2) Lighting Logic Interlock.
3) Temporary Override Mode.

2. Occupancy-Based Zone Lighting Control: VAV Terminal Unit Controllers shall provide an auxiliary binary output to serve as the interface to an associated lighting relay panel. Based upon the status of either an occupancy sensing device or manual wall switch, the VAV Terminal Unit Controller shall provide a contact output to automatically turn on or off the lights. This accommodates occupant requirements while reducing electrical consumption.
3. Temporary Override Modes: Temporary Occupancy Mode: The controller interface to the zone temperature sensor shall allow for an optional momentary switch to change the mode of the controller optionally interlock the room lights for a preset amount of time.
4. Alarm Management: Each VAV Terminal Unit Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
5. Unitary Controllers:

a. Unitary Controllers shall support, but not be limited to, the following types of systems to address specific applications described in the Sequence of Operation, and for future expansion:

1) Fan Coils.
2) Unit Heaters.

b. Unitary Controllers shall support the following types of point inputs and outputs:

1) Heating and/or Cooling Outputs.
2) Fan Output.

c. Unitary controllers shall support the following library of control strategies to address the requirements of the sequences described in the "Execution" portion of this specification, and for future expansion:

1) Daily Schedules.
2) Lighting Logic Interlock.
3) Temporary Override Mode.

6. Occupancy-Based Zone Lighting Control: Unitary controllers shall provide an auxiliary binary output to serve as the interface to an associated lighting relay panel. Based upon the status of either an occupancy sensing device or manual wall switch, the Unitary controller shall provide a contact output to automatically turn on or off the lights.
7. Temporary Occupancy Mode: The Controller interface to the zone temperature sensor shall allow for an optional momentary switch to change the mode of the controller from economy to comfort and optionally interlock the room lights for a preset amount of time.
8. Air Handling Unit (AHU) Controllers:

a. Controllers shall support, but not be limited to, the following configurations of systems to address current requirements as described in the Sequence of Operation:

1) Air Handling Units

b. AHU Controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally standalone fashion.
c. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation specified in the "Execution" portion of this specification.
d. Continuous Zone Temperature Histories: Each AHU Controller shall automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.
e. Alarm Management: Each AHU Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

2.19 OPERATOR INTERFACE

A. Provide new operator workstation computer:

1. Hardware Minimum Requirements: IBM Compatible PC, Pentium IV 3GHZ Processor or AMD Athlon equivalent, Desktop, 200 GB hard disk (minimum), 512 MB RAM (minimum), onboard video adapter, DVD/RW and DVD-ROM, soundcard and speakers, four (4) USB 2.0 ports (minimum), two (2) serial ports, one (1) parallel port, 10/100/1000 MB LAN/ethernet card, internal modem.
2. Peripherals: 19” LCD display, color printer, wireless keyboard, and wireless mouse.
3. Software: Windows XP-Pro

B. All BAS connected workstations shall function in a true multi-user, multi-tasking environment:

1. All terminals can access the same network at the same time.
2. All terminals can access and/or control the same DCU at the same time.
3. All terminals can access and/or modify the same database at the same time.
4. All terminals shall be able to archive data, alarms, and network actions to hard disk regardless of what application programs are being currently executed (i.e., LAN operating system, word processing, etc.). All archiving disk traffic shall be accomplished on-line without effecting the operation of the current programs.

C. Additional on-line functions, supported concurrently in every workstation without rebooting, shall include, but not limited to:

1. On-line database development and editing.
2. On-line BAS implementation and tuning.
3. On-line graphics development.
4. Real time facility control.

2.20 FRONT END GRAPHICS

A. The BAS contractor shall provide all the necessary hardware, data, information, and graphical images for the DDC system to publish fully interactive web-page graphics for monitoring and operating the DDC system's controllers using only a standard web browser. Support for both Microsoft Internet Explorer and Netscape Navigator must be provided.

B. The contractor shall include developed graphics for each piece of equipment being controlled and/or monitored by the BAS. BAS graphics will include the following screen pages as a minimum, but not limited to:

1. System Pages:

a. Initial Screen. Provide building address and links to system screens on a scanned-in background of the building front elevation. Elevation will be from an architectural rendering or photograph. Links will be provided to each floor plan and as applicable, each mechanical chiller plant, electrical monitoring system and fuel monitoring systems.
b. Building floor plan layouts will show every room. Where temperature and humidity sensors are installed in the building, show readings on the floor plan. Show all equipment including chillers, AHUs, PIUs, VAVs, generators, etc. Provide links to each piece of equipment and to system pages.
c. Chiller plant will default to the chilled water system loop. Show each chiller and chilled water pump with double lined water piping. Show all water temperatures and flows, basic chiller operating points and equipment status. Layout of the chiller plant will resemble the equipment layout in the building. Leave and identify spaces for future equipment as shown in the construction drawings. Provide links to the other system pages and condenser water page. Condenser water page to be similar to the chiller page. Provide link to integrated chiller data. Show data for chillers on one page.
d. Electrical monitoring will show switchgear status and all alarm points for electrical equipment. Provide a one-line diagram showing switchgear, generators, etc. Diagram should show status of each piece of equipment and breakers.
e. Fuel systems will show generators, fuel storage tanks, fuel pumps and day tanks. Provide a schematic of the fuel piping system.

2. Equipment Pages:

a. Chillers: Show all information for the chiller(s) on a single page. Show high and low alarm limits for each item. Provide links to condenser and chilled water pages. Layout of the chiller pages will resemble the equipment layout in the building. Leave and identify spaces for future equipment as shown in the construction drawings.
b. AHUs: show a 3D schematic of the AHU configuration with sensing points at the correct locations. If the unit has a VFD, show information and provide a link to the VFD box page.
c. VAV Boxes: Provide a floor plan showing the VAV box and the area the box serves. Show all sensing points on the page at the unit.

3. Fire Alarm: (if the BAS integrates to the fire alarm panel) provide a floor plan with each zone. Provide alarm points for each level of HSSD and Fire for all the zones. Fire protection monitoring will show each preaction and wet sprinkler system and each HSSD zone. Graphic plans will show each smoke and heat detector. Upon activation of a detector, the zone will indicate an alarm.

PART 3 – EXECUTION

3.01 WIRING

A. All electrical wire, conduit, cable, fittings, junction boxes, connectors, etc., associated with the systems, including interlock wiring, shall be furnished and installed complete under these specifications.

B. Installation shall be in accordance with the requirements of Division 26, the National Electrical Code and local codes. All electrical work included under this section shall be complete with labor, materials and installations.

C. Run all wiring and conduit concealed unless conditions do not allow. Secure approval from Engineer prior to installing surface raceway. Where surface raceway is required, it shall be wire mold or approved equal.

D. All control wiring routed in conduit shall not have any other type of wiring (power, etc.) routed in the same conduit.

E. Where required for electronic controls or interfacing, provide relays and other devices with low impedance contacts. Where required to maintain proper relay operation and prevent chatter, increase minimum control wire gauges specified herein.

F. All line voltage electrical wiring shall be enclosed in conduit. All exposed low voltage electrical wiring shall be installed in conduit or EMT. All low voltage wiring located above ceilings in plenums shall be 25/50 flame spread/smoke developed rated and UL listed. Support wiring 24″ OC by clips to structure.

G. For control systems, all wiring will be manufactured by Beldon or equal. Cabling for pulse demand meter shall be as manufactured by Beldon or equal. Provide cable in accordance with manufacturer’s recommendations.

3.02 INSTALLATION REQUIREMENTS

A. Any panels associated with the control system shall be furnished and installed under this section of the work. Connected to numbered terminal strips shall terminate panel wiring. Wire nut connections shall not be allowed.

B. All devices, panels, etc. furnished and/or installed shall be located where they can be calibrated and maintained from the floor without use of a ladder. These items shall be identified by means of plates made of plastic, suitably engraved, embossed or punched.

C. Any conduit on roof shall be at an absolute minimum and shall have prior written approval.

D. All conduit and fittings used indoors and outdoors shall be metal to minimize corrosion and moisture entry.

3.03 LOCATING DDC PANELS

A. In order to minimize wiring costs, DDC panels should be installed near equipment or systems, which are to be monitored and/or controlled. Panels located in administrative, common areas, or equipment aisles will be recessed mounted. Panels mounted in electrical or mechanical rooms will be surface mounted.

B. Consider providing sub-unit controllers or I/O expansion units near each cluster of sensor/actuator points, with sub-unit controllers and I/O expansion units reporting to the stand-alone controllers. Where practical, Application Specific Controllers or stand-alone controllers should be installed in mechanical equipment rooms.

C. All PC boards enclosed in metal boxes shall be mounted to a non-conductive, non-metallic surface to avoid shorting or grounding.

3.04 POWER/ENVIRONMENT/SPACE REQUIREMENTS

A. The environmental conditions in the space in which the stand-alone controllers and associated equipment are located shall meet the manufacturer's requirements of 30°F to 120°F and 5% RH to 95% RH.

B. Provide adequate space in front of the equipment for easy access and repairs. Provide adequate lighting over all DDC equipment and panels enclosing interfacing devices.

3.05 UTILITY METERING

A. Chilled Water/Hot Water Btu Metering: All Btu meters will be specified and sized by the Emory Utility Engineer. All Btu meters will be installed per manufacturer recommendations. Mechanical contractors need to review installation plans with the Emory Utility Engineer.

B. Steam Metering: All steam meters will be specified and sized by the Emory Utility Engineer. All steam meters will be installed per manufacturer recommendations. Mechanical contractors need to review installation plans with the Emory Utility Engineer.

3.06 OPERATOR INSTRUCTION AND TRAINING

A. During system commissioning and at such time as acceptable performance of the system hardware and software has been established, the BAS contractor shall provide on-site operator instruction to the Owner's operating personnel. Operator instruction during normal working hours shall be performed by a competent BAS contractor representative familiar with the system's BAS software, hardware and accessories.

B. At a time mutually agreed upon during system commissioning as stated above, BAS contractor shall give 16 hours of instructions to the Owner's designated personnel on the operation of all central processing and peripherals and describe intended use with respect to the programmed functions specified. Operator orientation of the FMS shall include, but not be limited to, the overall operational program, equipment functions (both individually and as part of the total integrated system), commands, advisories, and appropriate operator intervention required in responding to the system's operation. An Owner's Manual, prepared for this project by the BAS contractor, shall be used in addition to the instruction. Two (2) copies of the Owner's Manual shall be provided.

C. Sixteen hours of additional instruction by the BAS contractor shall be provided to the Owner's designated personnel. This instruction shall provide a description of the chronological information flow from field sensors, contacts and devices to the centrally located system. The overview of the system's communication network shall be to provide a better understanding to the operator of the interplay between initiating devices, field processing units, system communications, and their importance within the operating system.

3.07 SEQUENCE OF OPERATION

A. The sequences of operations are to be used in conjunction with the I/O Summaries. Points indicated on the I/O shall be used to accomplish the sequences. Any points required to accomplish the sequences shall be provided whether indicated on the I/O or not. Points indicated on the I/O, but not utilized to accomplish any sequences, shall be provided for information and alarming purposes.

B. Single Zone/Constant Volume Air Handling Unit (DX):

1. Each unit shall be provided with its own dedicated stand-alone controller. The unit shall be started and stopped by the BAS based on occupancy. Space temperature sensors shall be located in the space to monitor space temperature. Sensors shall be located in the ductwork to monitor supply air temperature, return air temperature, mixed air temperature and OSA temperature.
2. Upon unit start-up command, motorized supply, and return dampers shall open, OSA and relief damper shall close, and end switches shall prove prior to unit start.
3. Unit controls shall modulate compressors, condenser fans and electric heating coil to maintain space temperature of 74°F.
4. Night Setback Operation: During unoccupied hours, the unit shall cycle to provide heating only. Maintain a minimum room temperature of 50°F (adjustable).
5. Unoccupied Operations: Provide a pushbutton switch, mounted integrally to the space temperature sensor, to all units to operate as in an occupied mode.
6. Unit Lockout: Upon refrigeration failure, unit shall shut down.
7. Upon a drop in OSA temperature below 70°F, the OSA and relief damper shall be fully open and the return damper shall be closed. Upon a rise in space temperature, the compressor(s) shall run to maintain setpoint. Upon a fall in space temperature, the OSA and relief damper shall modulate closed and the return damper shall modulate open in direct proportion. Upon a fall in OSA temperature to below 55°F, the compressor(s) shall be disabled and the OSA and relief damper shall modulate closed and the return damper shall modulate open in direct proportion to maintain room setpoint.
8. Upon a rise in space humidity to 50% (adjustable), the AHU shall revert to mechanical cooling with OSA and relief damper closed and return damper open for a minimum of 12 hours (adjustable).
9. Fan Status: Monitor fan operations with a current switch with appropriate fan failure alarm.
10. Fire Alarm: Shutdown shall be through hardwired contacts from the fire alarm panel to each AHU unit. BAS contractor to provide graphic display of unit shut down during a fire.
11. Filter Status: Monitor filter status with a differential pressure switch and provide filter alarm.

C. Single Zone/Constant Volume Air Handling Unit (CHW):

1. Each unit shall be provided with its own dedicated stand-alone controller. The unit shall be started and stopped by the BAS based on occupancy. Space temperature sensors shall be located in the space to monitor space temperature. Sensors shall be located in the ductwork to monitor supply air temperature, return air temperature, mixed air temperature, and BSA temperature.
2. Upon unit start-up command, motorized supply, and return dampers shall open, OSA and relief dampers shall close and end switches shall prove prior to unit start.
3. BAS controls shall module the chilled water and electric heating coil to maintain space temperature of 74°F (adjustable).

4. Upon a drop in OSA temperature below 70°F, the OSA and relief damper shall be fully open and the return damper shall be closed. Upon a rise in space temperature, the compressor(s) shall run to maintain setpoint. Upon a fall in space temperature, the OSA and relief damper shall modulate closed and the return damper shall modulate open in direct proportion. Upon a fall in OSA temperature to below 55°F, the compressor(s) shall be disabled and the OSA and relief damper shall modulate closed and the return damper shall modulate open in direct proportion to maintain room setpoint.
5. Upon a rise in space humidity to 50% (adjustable), the AHU shall revert to mechanical cooling with OSA and relief damper closed and return damper open for a minimum of 12 hours (adjustable).
6. Night Setback Operation: During unoccupied hours, the unit shall cycle to provide heating only. Maintain a minimum room temperature of 50°F.
7. Unoccupied Operations: Provide a pushbutton switch, mounted integrally to the space temperature sensor, to all units to operate as in an occupied mode.
8. Fan Status: Monitor fan operations with a current switch with appropriate fan failure alarm.
9. Fire alarm shutdown shall be through hardwired contacts from the fire alarm panel to each AHU unit. BAS contractor to provide graphic display of unit shut down during a fire.
10. Filter Status: Monitor filter status with a differential pressure switch and provide filter alarm.
11. A low limit freezestat will be provided and installed in the mixed air to shut down the fan and close the outside air damper whenever the mixed air temperature falls below the adjustable setpoint. The freezestat will be manually reset and will be monitored by the BAS for alarm.
12. Minimum OSA operator. _____

D. Fan Powered Mixing Boxes (w/electric heat):

1. Each unit shall be provided with its own dedicated stand-along controller. The FMAS (BAS?) controller, transducer, fan differential pressure switch and damper actuator shall be sent to the box manufacturer for factory mounting. The controller shall be equipped with a flow transducer to indicate primary air CFM flow. Fan status shall be monitored via a differential pressure switch.
2. The space temperature sensor shall have an override push-button for after hours use. When the override push-button is used, the VAV air-handling unit shall start and operate for two (2) hours.
3. Upon a need for cooling, the primary air damper shall modulate to maintain space temperature cooling setpoint. The primary air damper shall maintain the minimum and maximum CFM setpoints as programmed (adjustable). The fan and electric heat shall be off.
4. Upon a need for heating in the space, the primary air damper shall close to the minimum air flow position, the fan shall start and electrical stages of heating shall be controlled as necessary to maintain space temperature heating setpoint.
5. During morning warm-up, the primary air damper shall be 50% open with the fan off.

3.08 DIVISION OF RESPONSIBILITY

A. The following table outlines responsibilities for the various mechanical equipment and associated controls. The table does not necessarily cover all points but should be used as a general guideline.

FIELD DEVICE	FIELD DEVICE SUPPLIER	FIELD DEVICE INSTALLED BY	WIRING BY CONTROLS VENDOR	WIRING BY ELECTRICAL CONTRACTOR	COMMISSIONING OF DEVICE BY
CHILLER					
Chiller Points	Chiller manufacturer	Chiller manufacturer	DDC panel to MCC terminal strip.	MCC terminal strip to chiller.	Mech, Controls Vendor
Water Flow Switch	Controls Vendor	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor

FIELD DEVICE	FIELD DEVICE SUPPLIER	FIELD DEVICE INSTALLED BY	WIRING BY CONTROLS VENDOR	WIRING BY ELECTRICAL CONTRACTOR	COMMISSIONING OF DEVICE BY
Water Flow – Meter	Meter by Controls	Mechanical	DDC panel to device.	N/A	Mech, Controls Vendor
Cooling Tower Fans	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
Water Temperature	Sensor and well by DDC	Well by Mech. Sensor by Controls.	DDC panel to sensor.	N/A	Controls Vendor
Motorized Valve	Controls Vendor	Actuator by Controls. Valve by Mech	DDC panel to valve.	N/A	Controls Vendor
Refrigerant Monitor	Chiller Manufacturer	Sensors by Controls. Sample tubing by Mech.	DDC panel to device.	Electrical panel to device.	Controls Vendor
Refrigerant Monitor Annunciation Devices	Chiller Manufacturer	Electrical	Low voltage from monitor to devices.	120V from monitor to devices.	Controls Vendor
Energy metering -Pulsed Input	Meter by Mech/Elect	Mech/Elect	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech/Elect
Current/Energy Metering -Analog input	Current transformers by Mech/Elect. Transducers by Controls.	Current transformers by Mech/Elect Transducers by Controls.	Current transformer to transducer. Transducer to DDC panel.	N/A	Controls Vendor, Mech/Elect
MCC Indication, Test Switches, Fused 24V Power Supply and Interposing Relays for DDC Output.	Mech/Elect	Mech/Elect	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech/Elect
AHU					
Fan	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
Temp/Humidity Sensor	Controls Vendor	Controls Vendor	DDC panel to sensor.	N/A	Controls Vendor
Air Pressure Sensor	Controls Vendor	Sensor by Controls. Air tubing by Mech	DDC panel to sensor.	N/A	Controls Vendor
Air Flow Switch	Controls Vendor	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device. Fire rated wiring for fire indication.	Mech
Air Flow Measuring Station	Controls Vendor	Mech	DDC panel to device.	N/A	Controls Vendor
Heater Protection Thermostat	Controls Vendor	Mech	N/A	HPT in heater safety circuit.	Mech
Solid State Heating Controller	Controls Vendor	Electrical Contractor in MCC	DCC panel to MCC terminal strip.	MCC terminal strip to device.	Electrical Contractor
Motorized Control Valve	Controls Vendor	Actuator by Controls. Valve by Mech	DDC panel to device.	N/A	Controls Vendor
Current Switch	Controls Vendor	Controls Vendor	DDC panel to device.	N/A	Controls Vendor
Damper Motor	Controls Vendor	Mech	DDC panel to device.	N/A	Mech, Controls Vendor

FIELD DEVICE	FIELD DEVICE SUPPLIER	FIELD DEVICE INSTALLED BY	WIRING BY CONTROLS VENDOR	WIRING BY ELECTRICAL CONTRACTOR	COMMISSIONING OF DEVICE BY
Remote Control Switch	Electrical Contractor	Electrical Contractor	DDC panel to MCC terminal strip.	Remote switch to MCC terminal strip.	Electrical Contractor
Filter Pressure Switch	Controls Vendor	Mech	DDC panel to device.	N/A	Controls Vendor
MCC Indication and Test Switches. Fused 24V Power Supply and Interposing Relays for DDC Outputs.	Electrical Contractor	Electrical Contractor	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Electrical Contractor
Water Detection Device	Controls Vendor	Controls Vendor	DDC panel to device.	N/A	Controls Vendor
VAV BOX REHEAT TERMINAL UNITS					
Temperature Sensor	Controls Vendor	Controls Vendor	DDC panel to device.	N/A	Controls Vendor
Velocity Sensor (for pressure independent operation).	Velocity sensor by VAV box manufacturer. Pressure transducer by Controls.	Velocity sensor Installed by VAV box mfg. Pressure transducer and tubes installed by Controls.	Pressure transducer to DDC panel.	N/A	Mech, Controls Vendor
Damper Actuator	Controls Vendor	Controls Vendor	DDC panel to device.	N/A	Mech, Controls Vendor
Heater Protection Thermostat	Controls Vendor	Mech	N/A	HPT in heater safety circuit.	Mech
Heater	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device	Mech
Hot Water Control Valve	Controls Vendor	Mech	DDC panel to device.	N/A	Mech, Controls Vendor
Solid State Heating Controllers	Controls Vendor	Electrical Contractor in MCC	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Electrical Contractor, Controls Vendor
Fan (for fan assisted boxes)	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech
MCC Indication and Test Switches Fused 24V Power Supply and Interposing Relays for DDC Outputs.	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Electrical Contractor
GENERAL					
Control Dampers and Actuators	Controls Vendor	Mechanical	DDC panel to device.	N/A	Controls Vendor
Control Valves and Actuators	Controls Vendor	Mechanical	DDC panel to device.	N/A	Controls Vendor
120V UPS Power to Controllers	Electrical	Electrical	N/A	All conduit, wiring, and circuiting.	Controls Vendor
CRAC Unit Leak Detection	CRAC manufacturer	Detection “rope” by mechanical.	Control wiring from unit to “rope”.	N/A	Controls Vendor
PUMPS					

FIELD DEVICE	FIELD DEVICE SUPPLIER	FIELD DEVICE INSTALLED BY	WIRING BY CONTROLS VENDOR	WIRING BY ELECTRICAL CONTRACTOR	COMMISSIONING OF DEVICE BY
Chilled Water and Hot Water	Mech	Mech	DDC panel to MCC terminal strip.	MCC to device.	Mech
Current Switch	Controls Vendor	Controls Vendor	DDC panel to device.	N/A	Controls Vendor
STEAM TO HOT WATER CONVERTER					
Control Valves	Controls Vendor	Mech	DDC panel to device.	N/A	Mech, Controls Vendor
Flow Switch	Controls Vendor	Mech	DDC panel to device.	N/A	Mech, Controls Vendor
FANS					
Fan	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
Current Switch	Controls Vencor	Controls Vendor	DDC panel to device.	N/A	Controls Vendor
FAN COIL UNITS					
Fan Coil	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
Control Valve	Controls Vendor	Mech	DDC panel to device.	N/A	Controls Vendor
HOT WATER UNIT HEATERS					
Unit Heater	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
Control Valve	Controls Vendor	Mech	DDC panel to device.	N/A	Controls Vendor
VARIABLE FREQUENCY DRIVE					
VFD	Mech	Mech	DDC panel to MCC terminal strip.	MCC terminal strip to device.	Mech, Controls Vendor
VFD Auxiliary Contacts	Supplied with equipment.	N/A	DDC panel to device.	N/A	Controls Vendor
LABORATORY AIRFLOW CONTROL SYSTEM					
Phoenix Valves	Controls Vendor	Mech	DDC panel to device.	N/A	Mech, Controls Vendor

END OF SECTION 23 09 23

FOR TRANSFER TO DRAWING FILES

SEQUENCES

I. CONSTANT VOLUME AIR UNITS:

A. Start/Stop - in auto starter position by D.D.C. control system. All safeties (firestat, smoke detector, fire alarm contents) operate in “hand” or “auto” position.

B. Hot Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature drop, setpoint (72°F, programmable).

C. Chilled Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature rise, setpoint (76°F, programmable) 4°F deadband differential built in between heating and cooling.

D. Freezestat - averaging bulb sensor, digital, stops unit at setpoint (40°F programmable) and alarm control system.

E. Economizer Control - modulating mixed air control by separate averaging bulb sensor across coil, active when outside enthalpy below return enthalpy, separate mixed air low limit set for 55°F. Close completely on fan shutdown.

F. Economizer Relief - modulating relief dampers open as economizer dampers open. Close completely on fan shutdown.

G. Filters Pressure - digital differential pressure transmitter across filters, alarms control system at “dirty filters” setpoint (programmable).

H. Fan Operation - current transducers indicate normal fan operation via output to control system.

I. Return Fan - interlocked with supply fan through control system. Provide fan confirmation via current transducers.

J. Minimum Outside Air Damper – opens on space reaching setpoint in “occupied” mode, normally closed. End switch contacts via control system confirming “open”.

FOR TRANSFER TO DRAWING FILES

SEQUENCES

I. _____ VOLUME AIR UNITS:

A. Start/Stop - in auto starter position by D.D.C. control system. All safeties (firestat, smoke detector, fire alarm contents) operate in “hand” or “auto” position.

B. Hot Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature drop, setpoint (72°F, programmable).

C. Chilled Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature rise, setpoint (76°F, programmable) 4°F deadband differential built in between heating and cooling.

D. Freezestat - averaging bulb sensor, digital, stops unit at setpoint (40°F programmable) and alarm control system.

E. Economizer Control - modulating mixed air control by separate averaging bulb sensor across coil, active when outside enthalpy below return enthalpy, separate mixed air low limit set for 55°F. Close completely on fan shutdown.

F. Economizer Relief - modulating relief dampers open as economizer dampers open. Close completely on fan shutdown.

G. Filters Pressure - digital differential pressure transmitter across filters, alarms control system at “dirty filters” setpoint (programmable).

H. Fan Operation - current transducers indicate normal fan operation via output to control system.

I. Return Fan - interlocked with supply fan through control system. Provide fan confirmation via current transducers.

J. Minimum Outside Air Damper – opens on space reaching setpoint in “occupied” mode, normally closed. End switch contacts via control system confirming “open”.

FOR TRANSFER TO DRAWING FILES

SEQUENCES

I. _____ VOLUME AIR UNITS:

A. Start/Stop - in auto starter position by D.D.C. control system. All safeties (firestat, smoke detector, fire alarm contents) operate in “hand” or “auto” position.

B. Hot Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature drop, setpoint (72°F, programmable).

C. Chilled Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature rise, setpoint (76°F, programmable) 4°F deadband differential built in between heating and cooling.

D. Freezestat - averaging bulb sensor, digital, stops unit at setpoint (40°F programmable) and alarm control system.

E. Economizer Control - modulating mixed air control by separate averaging bulb sensor across coil, active when outside enthalpy below return enthalpy, separate mixed air low limit set for 55°F. Close completely on fan shutdown.

F. Economizer Relief - modulating relief dampers open as economizer dampers open. Close completely on fan shutdown.

G. Filters Pressure - digital differential pressure transmitter across filters, alarms control system at “dirty filters” setpoint (programmable).

H. Fan Operation - current transducers indicate normal fan operation via output to control system.

I. Return Fan - interlocked with supply fan through control system. Provide fan confirmation via current transducers.

J. Minimum Outside Air Damper – opens on space reaching setpoint in “occupied” mode, normally closed. End switch contacts via control system confirming “open”.

FOR TRANSFER TO DRAWING FILES

SEQUENCES

I. CONSTANT VOLUME AIR UNITS:

A. Start/Stop - in auto starter position by D.D.C. control system. All safeties (firestat, smoke detector, fire alarm contents) operate in “hand” or “auto” position.

B. Hot Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature drop, setpoint (72°F, programmable).

C. Chilled Water Coil Control - by D.D.C. space temperature control, modulating valve open on temperature rise, setpoint (76°F, programmable) 4°F deadband differential built in between heating and cooling.

D. Freezestat - averaging bulb sensor, digital, stops unit at setpoint (40°F programmable) and alarm control system.

E. Economizer Control - modulating mixed air control by separate averaging bulb sensor across coil, active when outside enthalpy below return enthalpy, separate mixed air low limit set for 55°F. Close completely on fan shutdown.

F. Economizer Relief - modulating relief dampers open as economizer dampers open. Close completely on fan shutdown.

G. Filters Pressure - digital differential pressure transmitter across filters, alarms control system at “dirty filters” setpoint (programmable).

H. Fan Operation - current transducers indicate normal fan operation via output to control system.

I. Return Fan - interlocked with supply fan through control system. Provide fan confirmation via current transducers.

J. Minimum Outside Air Damper – opens on space reaching setpoint in “occupied” mode, normally closed. End switch contacts via control system confirming “open”.

SECTION 23 23 00
REFRIGERANT PIPING AND ACCESSORIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for field erected refrigeration piping.

B. Refrigerant piping shall connect all refrigeration components and accessories to form a complete and operable system.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 05 00 Common Work Results for HVAC

C. Section 23 05 53 Identification for HVAC Piping and Equipment

D. Section 23 07 00 HVAC Insulation

E. Section 23 81 26 Direct Expansion Equipment, Heat Pumps, and Gas Fired Heating Equipment

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide an isometric refrigerant piping diagram indicating equipment, accessories, fittings, offsets, size of pipe, length of pipe, changes in elevation, pressure drop in pipe length between equipment, and refrigerant velocities in pipes at both minimum and maximum loads.

C. The equipment manufacturer's approval shall appear on the piping diagram submitted.

1.04 QUALITY ASSURANCE

A. All components of the piping system shall be products intended for refrigeration systems.

B. ACR indicates Air Conditioning Refrigeration pipe.

C. Comply with ASHRAE 15, “Safety Standard for Refrigeration Systems.”

1.05 SYSTEM CONDITIONS

A. The system shall be installed to withstand the following conditions:

Design Working Pressure Rating	500 psig.
Maximum Operating Temperature	275°F.

PART 2 – PRODUCTS

2.01 PIPE

A. Copper Tube: ASTM B280, ACR Type “L” hard drawn copper.

2.02 FITTINGS

A. Sweat type wrought copper, long radius pattern.

2.03 SILVER BRAZING

A. Brazed Joints: Join piping with a copper-phosphorus (BcuP) or silver alloy (BAg) filler metal having a melting point of not less than 1100°F. NO SOLDER JOINTS SHALL BE PERMITTED.

B. Brazing flux shall be compatible with the filler material.

C. Braze ferrous to non-ferrous metals with Aircoil “J” or with ferrous metal manufacturer's recommended alloy.

2.04 ACCESSORIES

A. Line stop valves: Henry packed type with wing cap and bolted bonnet.

B. Sight glass-moisture indicator: see-through sweat type. Indicators shall be full size of liquid line up through 2-1/8″.

C. Filter drier: liquid line type.

D. Thermal expansion valve: solder-flange type with external equalizer and capillary power element. Valve body shall be solder-flange type. Select as recommended by the manufacturer.

E. Locking access port caps: Refrigerant circuit access ports shall be fitted with color-coded as appropriate, locking-type, tamper-resistant caps.

F. Pipe clamps: Provide vibration-isolating clamps with thermoplastic insert, B-Line BVT series or equal.

G. Refrigerant accessories shall be by Emerson Flow Controls (Alco), Danfoss, or Parker Hannifin (Sporlan).

PART 3 – EXECUTION

3.01 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gauge taps at strainers if they are not an integral part of strainers.

B. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

C. Install replaceable-core filter dryers for systems 5 tons and larger. Install permanent filter dryers for systems less than 5 tons.

D. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

E. Install thermostatic expansion valves as close as possible to distributors on evaporators.

F. Install valve so diaphragm case is warmer than bulb.

G. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

H. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

3.02 SUPPORT

A. Install hangers and supports to rigidly support the pipe and to remove strain at equipment connections.

B. Isolate piping at sleeves, hangers and supports with 6″ long preformed, rigid glass fiber pipe insulation enclosing the pipe. Install insulation saddles under insulation at hangers.

C. Install pipe to slope down in the direction of flow, one inch in twenty feet.

D. Install oil return traps at refrigerant hot gas and suction gas risers.

3.03 BRAZING

A. Comply with the procedures contained in AWS “Brazing Manual.”

B. Remove oxides on joining surfaces with sand cloth and steel wool. Ream pipe ends with a wire brushes.

C. Support and fit the joint closely. Apply flux to the joining surfaces. Heat joint and apply brazing alloy. Cool and thoroughly clean joint.

D. Feed nitrogen through the piping system when brazing joints.

E. Remove internal parts of valves and accessories while brazing.

3.04 TESTING

A. Comply with ASME B31.5, Chapter VI.

B. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

C. Fill system with nitrogen to the required test pressure.

D. System shall maintain test pressure at the manifold gage throughout duration of test.

E. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

F. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.05 SYSTEM CHARGING

A. Install core in filter dryers after leak test but before evacuation.

B. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

C. Break vacuum with refrigerant gas, allowing pressure to build

3.06 REFRIGERANT HANDLING

A. Intentional release of refrigerant to the atmosphere shall not be allowed. Any work requiring removal of refrigerant shall be accomplished with a recovery unit.

END OF SECTION 23 23 00

SECTION 23 31 00
DUCTWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the sheetmetal requirements for Division 23 ductwork.

1.02 RELATED SECTIONS

A. Section 23 05 00 Common Work Results for HVAC

B. Section 23 07 00 Mechanical Systems Insulation

C. Section 23 05 93 Testing, Balancing and Adjusting

D. Section 23 09 23 Building Automation and Temp Control System

E. Section 23 09 33 Electronic Automatic Controls

F. Section 23 33 15 Fire, Smoke and Combination Fire/Smoke Dampers

G. Section 23 37 13 Grilles, Registers, and Diffusers

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on damper performance including, but not limited to, total static pressure drop verses airflow shown for all multi-blade dampers, size and quantity of dampers required.

C. Provide shop drawing showing multi-blade damper dimensions, construction, duct connection sizes and electrical requirements.

D. Provide manufacturer’s instructions, indicate installation and support requirements.

E. Provide data on each liner type including, but not limited to, application, material, finish, thickness, density, operating temperature range, and mean thermal conductivity and related temperature.

F. Provide manufacturer’s instructions indicating installation and support requirements for duct liner.

1.04 STANDARDS

A. Refer to the SMACNA "HVAC Duct Construction Standards, Metal and Flexible", Third Edition, 2005, latest printing published by SMACNA.

B. Refer to the SMACNA “Duct Cleanliness for New Construction Guidelines”, latest printing.

C. Unless noted otherwise herein, all ductwork shall be constructed, sealed, and supported in strict compliance with the SMACNA standards referenced above.

D. UL 181A Closure Systems for Use with Rigid Air Ducts.

E. UL 181B Closure Systems for Use with Flexible Air Ducts and Air Connectors.

1.05 PRESSURE AND VELOCITY RATINGS

A. In supply air systems with terminals, ductwork shall be constructed and reinforced for 4000 FPM and 6″ static pressure between fan outlet and terminal inlets, unless otherwise noted. This construction shall be referred to as “medium pressure”.

B. Ductwork downstream of terminals, return ductwork, and exhaust ductwork, unless otherwise noted, shall be constructed and reinforced for 2000 FPM velocity and 2″ static positive or negative, unless otherwise noted. This construction shall be referred to as “low pressure”.

C. For all ductwork required to be constructed and reinforced for over 2″ positive or negative pressure, submit a Ductwork Reinforcing Schedule. This schedule shall indicate size, metal gauge, and reinforcement size and spacing, for all ductwork over 2″ pressure class.

1.06 DUCT DIMENSIONS

A. Duct sizes shown on drawings provide the minimum cross-sectional area required. Increase overall duct dimensions as necessary to accommodate duct liner thickness.

PART 2 – PRODUCTS

2.01 METAL MATERIALS

A. Sheetmetal shall be hot dipped galvanized steel of lock forming quality with minimum zinc coating of 1.25 ounces per square foot each side per ASTM A525. Exposed duct to be painted shall be “paint-grip” type or treated to accept paint.

B. Shower exhausts and kitchen dishwasher exhausts shall be constructed from aluminum flat sheet, type 3003-H14.

C. Dryer vents shall be constructed of 20 gauge (minimum) stainless steel factory fabricated low-pressure spiral lock seam type. Elbows and fittings shall be die-stamped type of the same material with fully welded seams and no protrusions into the airstream.

D. Formed reinforcing drives, slips, pocket locks, and standing seams shall be constructed from sheet metal stock of the same material as the associated ductwork. Intermediate reinforcing angles may be uncoated steel painted with two coats of primer.

E. Round and flat oval ductwork shall be factory fabricated low-pressure spiral lock seam type constructed in accordance with the above-referenced SMACNA standards. Round snap-lock type ductwork shall not be installed on project. All fittings shall be factory fabricated by same manufacturer as ductwork. Round duct below grade shall be minimum 20 gauge. Manufacturers shall be Semco, Monroe Metal, United Sheet Metal, Lindab, or approved equivalent.

F. Double Wall Spiral Duct shall be factory fabricated spiral galvanized steel inner liner and outer shell conforming to ASTM A-527-67. The galvanized coating of the outer shell shall be paint-grip type. The inner liner shall be perforated to provide sound attenuation. The insulation shall be 1" thick with a thermal conductivity of 0.27. All fittings shall be factory fabricated by same manufacturer as ductwork. Manufacturer's shall be United Sheet Metal, Semco, Monroe Metals, or approved equivalent.

2.02 ELASTOMERIC FLEXIBLE DUCT LINER

A. Internal flexible, closed-cell non-wicking elastomeric liner shall be pinned, fabricated factory-applied duct insulation with a self-adhering backing in sheet form. Liner shall meet the requirements of ASTM C534 for elastomeric insulation. Insulation shall be made with an EPA registered, anti-microbial agent to guard against potential growth of fungus and bacteria and shall meet UL181 for mold growth, and ASTM G21 and G22 for fungi and bacterial resistance. Duct liner shall be 1″ thick, minimum 3 lb. density, with surface suitable for duct velocities to 6000 f.p.m. without erosion. Thermal conductivity shall not exceed 0.27 at 75°F and a maximum water vapor transmission of 0.08 perm-inches. Liner shall be manufactured without the use of CFCs, HFCs, or HCFCs and shall be formaldehyde free, low VOC, fiber free and dust free. Materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E84.

2.03 LINER ADHESIVE

A. Liner adhesives shall be low VOC, water based, meeting the requirements of the liner manufacturer. Products used must comply with the current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168, with a maximum VOC emission of 70 grams per liter. They shall be manufactured by the insulation manufacturer or by Ductmate, Foster, Hardcast, McGill Airseal, or 3M.

2.04 RANGE HOOD EXHAUST DUCTWORK

A. Duct shall be 16-gauge black steel with all joints continuously welded and ground smooth.

2.05 ROUND MEDIUM PRESSURE DUCTWORK

A. Medium pressure round ductwork shall be manufactured or fabricated spiral lockseam conduit with duct and fittings constructed per referenced SMACNA standards.

B. Joints shall be made with beaded slip coupling to 20″ size and three (3) piece gasketed flanged joints for sizes 21″ to 72″. For 73″ size and up, use companion angle flanged joints as defined in SMACNA standards.

C. Branch fittings and reducers shall be metal spinnings, minimum 20 gauge.

D. Elbows shall be mitered or stamped type with center line radius of 1½ times duct diameter. Mitered elbows shall be minimum all welded five-section type.

E. 45° "Y" fittings shall be used at takeoffs from round duct.

2.06 PLENUMS AND CASINGS

A. Field-fabricated plenums and casings shall be constructed per referenced SMACNA standards, except minimum steel gauge shall be 18 and minimum angle size 1″ x 1″ x 1/8″. Angles shall be galvanized. Access doors shall be hinged, gasketed, and latched. Minimum size shall be 20″ width by 48″ high unless casing is 60″ or less high. Door height shall be adjusted to 12″ less than casing height for casings less than 60″ high. All plenums shall be lined with 1″ (2″) thick rigid Type II duct liner.

B. Cover entire surface of plenum over liner with 22 gauge perforated galvanized sheets with 1/8″ diameter openings on 5/8″ centers, attached with stick clips spaced at 18″ on center each way, spot welded with 1″ galvanized disc washers.

2.07 ACCESSORIES

A. Low pressure splitter damper constructed of same material and two gauges heavier than ductwork in which installed. Damper heel shall be attached to cold-rolled galvanized steel pivot rod minimum ¼″ diameter, with bearing at each end. Damper leading edge shall be adjusted by a cold-rolled galvanized steel control rod which passes through a lockable ball joint bracket installed on duct exterior.

B. Low pressure single blade manual dampers shall be constructed in accordance with Figure 7-4 of referenced SMACNA standards, except as noted. Provide end bearings and continuous rods on all dampers except those 10″ round and smaller in 1″ pressure class ductwork. Single blade dampers shall not be used in ducts over 30″ in one dimension.

C. Access doors shall be galvanized steel hinged and latched insulated type, minimum 8″ x 8″ size, manufactured per referenced SMACNA standards. Where access to equipment requires a larger door, size shall be increased to allow full accessibility. Hinges shall be furnished with brass pins. Where hinges do not allow for access, latches shall be provided on all sides. Manufacturers shall be Air Balance, Krueger, Nailor, Ruskin, or Ventlok.

D. Flexible ductwork in low-pressure systems shall be factory fabricated Class 1 type rated for a minimum of 4″ positive or ¾″ negative static pressure. In medium pressure systems, flexible ductwork shall be rated for 10″ positive and 1″ negative static pressure. All flex ductwork shall be insulated type, tested in accordance with UL 181, with a minimum R-value of 6.0. Construction shall be metalized polyester over galvanized steel wire or vinyl impregnated fiberglass on tedlar covered steel helix or spiral. Insulation shall be 1″ thick fiberglass with vapor barrier jacket. Manufacturers shall be Atco, Flexmaster, or Thermaflex.

E. Low pressure spin-in fittings with dampers shall be furnished at round duct run-outs to diffusers, grilles, and registers unless otherwise show on the drawings. Fittings shall be spin-in type (stick-on type is not acceptable) complete with damper, 3/8″ square one-piece damper shaft, nylon shaft bushings at exterior duct wall penetrations, 2″ stand-off bracket, locking quadrant, and factory sealed longitudinal seams. Barrel leakage to be less than 1 cfm at 4″ sp. Fittings shall be constructed in accordance with referenced SMACNA standards. Fittings shall be Flexmaster FLD-B03 with sealed seams or equal by Crown or Jer-Air.

F. Flexible duct connectors shall be non-combustible glass fabric of 30 oz. per square yard minimum weight fabric, coated on each side with fire-retardant Neoprene for indoor applications and Hypalon on exterior applications. Fabric shall be 3″ wide and attached at each edge with a strip of 24-gauge galvanized steel. Material shall be tested in accordance with UL 181 and shall be suitable for contained exposure 200°F continuously.

G. Low VOC water-based duct sealing compounds shall be manufactured to comply with NFPA 90A, UL listed and complying with ASTM E84. The sealants must be rated for high pressure applications, both indoor and outdoor, and also comply with the current VOC limits of the Bay Area Air Quality Management District Regulation 8, Rule 51, with a maximum VOC emission of 250 grams per liter. Sealants shall be by Ductmate, Foster, or Hardcast. Pressure sensitive tape is not acceptable.

H. Intake and relief hoods shall be aluminum construction of the low silhouette type complete with 1″ fiberglass insulation, bird screen, hinged hood, reinforcing angles, mounting base and insulated twin-shell curb unit. Acme, Jenn-Air, Greenheck, or PennBarry.

2.08 PRESSURE RELIEF DOORS

A. Pressure relief doors shall be adjustable spring-loaded type. Frames shall be formed 12-gauge galvanized steel. Door shall be 18″ x 18″ for positive pressure applications, 8″ x 18″ for negative applications, constructed of 12 U.S. Gauge (minimum thickness) formed galvanized steel and fitted with polyurethane foam seals. Ruskin P(N)RD18, Nailor Industries, or equal.

2.09 BACKDRAFT DAMPERS

A. Backdraft dampers shall be multi-blade parallel action type. Frames shall be formed 20-gauge galvanized steel. Maximum individual damper width shall not exceed 42″. Blades shall be 5″ (maximum) wide, constructed of 28 U.S. Gauge (minimum thickness) formed galvanized steel attached to stainless steel pins and fitted with mechanically bonded vinyl blade seals. Ruskin S3G or equal by Arrow United, Cesco, Nailor Industries, Greenheck, or National Controlled Air.

2.10 MANUAL VOLUME DAMPERS

A. Manual dampers shall be multi-blade opposed action type. Frames shall be formed 13-gauge galvanized steel channel with corner braces above size 20″ wide and 20″ high. Maximum individual damper width shall not exceed 48″. Blades shall be 6″ (maximum) wide, constructed of 16 U.S. Gauge (minimum thickness) formed galvanized steel attached to cold-rolled galvanized steel axles. Axle bearings shall be self-lubricating nylon or Teflon. Damper shall be controlled by factory assembled operating linkages concealed in the frame outside of airstream, constructed of galvanized steel. Provide adjustable locking quadrant at each damper section. Ruskin CD35 or equal by Arrow United, Cesco, Nailor Industries, Greenheck, or National Controlled Air.

2.11 CONTROL DAMPERS

A. See Section 23 09 23 Building Automation and Temperature Control System for control dampers.

PART 3 – EXECUTION

3.01 GENERAL DUCTWORK INSTALLATION

A. All ductwork shall be fabricated, stored, and installed per the SMACNA “Duct Cleanliness Guidelines for Intermediate Level Cleanliness”. This guide includes the requirement for ducts to be stored in a clean, dry area, the installation area shall be protected from the elements, and temporary closure of open ends on completed ducts, and other measures intended to minimize contamination of the circulating air.

B. All (existing or new) ductwork that is open-ended (temporarily or permanently) shall be covered, sealed and protected to eliminate the entry of foreign debris into the ductwork system. All existing return air ductwork that is to be open-ended during construction shall be covered with MERV 8 filter media.

C. Provide offsets, elbows, and transitions to coordinate with other work. Changes in shape or dimension shall be made with a maximum slope as noted in SMACNA HVAC Duct Construction Standards.

D. Ducts over 12″ in either dimension, except those to be externally insulated with rigid board or internally insulated, shall have all sides cross.

E. Leave system clean from dust, trash, and foreign matter.

F. Installation shall be airtight and free from rattles, vibration, and movement.

G. Provide access doors for access to fire dampers, controls, coils, duct smoke detectors, humidifiers, and where required for cleaning, oiling, inspection, and maintenance.

H. Install flexible connections at each air handling unit connection and each fan connection, unless air handling units are internally isolated.

I. Paint interior ductwork visible behind grilles or register flat black.

J. Coordinate locations that ductwork is required to be painted with architect and engineer. In general, all exposed ductwork in occupied areas shall be paint grip type and shall be painted color as chosen by owner/architect.

3.02 DUCTWORK SUPPORT

A. Ductwork shall be supported per SMACNA standards except hanger spacing shall not exceed 8′ for rectangular duct and 10′ for round rigid ductwork.

B. Ductwork penetrating floors in equipment rooms shall be provided with a 4″ high concrete curb around the duct.

C. Support vertical risers at each floor.

3.03 LOW PRESSURE DUCTWORK

A. Squared and radiused elbows shall be constructed as per Figure 4-2 of referenced SMACNA standards, except no mitered elbows or square elbows without vanes are allowed. Turning vanes shall be constructed as per Figures 4-3 and 4-4.

B. Divided flow branches shall be constructed as per Figure 4-5 of referenced SMACNA standards, always with splitter damper.

C. TDC and TDF duct joint systems may be used as outlined in SMACNA standards, provided corner pieces are used and bolted at all locations.

3.04 MEDIUM PRESSURE DUCTWORK

A. Rectangular ductwork shall have only radiused elbows, with radius equal to 1½ times the duct width wherever possible. Where radius is less than 1½ times the duct width, turning vanes shall be installed as per Figures 4-3 and 4-4 of referenced SMACNA standards.

B. Divided flow branches shall be constructed as per Figure 4-5 of referenced SMACNA standards, except no splitter dampers are to be installed.

C. Round branch duct takeoffs from round or rectangular duct shall be as detailed on the plans. Straight taps or spin ins shall not be used in medium pressure duct.

D. Splitter dampers shall not be used in medium pressure ductwork.

E. Round and flat ductwork shall be assembled with sheet metal screws and duct sealer installed on slip joints.

F. TDC and TDF duct joint systems may be used as outlined in SMACNA standards, provided corner joints are bolted at all locations.

3.05 DUCT SEALING

A. Seal Levels:

1. Seal Class A – Seal all transverse joints, longitudinal seams, and all duct wall penetrations.
2. Seal Class B – Seal all transverse joints and longitudinal seams.
3. Seal Class C – Seal all transverse joints.

B. Seal Procedures:

1. All longitudinal and transverse joints, seams and connections in and between metallic and non-metallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards.
2. Seal joints per SMACNA procedures with duct sealer as duct is erected. Sealing ductwork after erection is complete will not be accepted. Cover all joints to be sealed with sealer and assemble in normal fashion. Duct Seal Levels are as follows:

    a. For Seal Level A and B: Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL 181A or UL 181B by and independent testing laboratory and the tape is used in accordance with that certification.

3. Where ductwork is bolted together, provide 1/8″ thick gaskets at each bolted joint per SMACNA standards.
4. Spiral lock seams in a round or flat oval duct need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps, and other branch connections, access door frames and jambs, duct connections to equipment, etc.
5. Closure systems used to seal factory-made rigid air ducts or air connectors shall comply with UL 181A and shall be marked “181A-P” for pressure-sensitive tape, “181A-M” for mastic, or “181A-H” for heat-sensitive tape.
6. Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181B-M” for mastic.
7. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply UL 181B and shall be marked “181B-C”.
8. Openings for rotating shafts shall be sealed with bushings or other devices that seal off air leakage.
9. Unlisted duct tape is not permitted as a sealant on any duct.

C. All low-pressure ductwork shall be sealed as follows:

1. Exterior – Seal Class A, except for exhaust ducts, which shall be Seal Class C.
2. Unconditioned Interior Space – Seal Class B except for exhaust ducts, which shall be Seal Class C.
3. Plenums or Conditioned Space – Seal Class C, except for exhaust ducts, which shall be Seal Class B.

D. All medium pressure ductwork and all ductwork that will operate at over 2″ static pressure shall be sealed as follows:

1. Exterior – Seal Class A, except for exhaust ducts, which shall be Seal Class C.
2. Unconditioned Interior Space – Seal Class A except for return ducts, which shall be Seal Class B, and exhaust ducts, which shall be Seal Class C.
3. Plenums or Conditioned Space – Seal Class B, except for return ducts, which shall be Seal Class C.

3.06 FLEXIBLE DUCTWORK INSTALLATION

A. Flexible duct shall be sealed and mechanically fastened to both the supply end and the air distribution (diffuser) end. See Duct Sealing section above for information on sealing and closure systems.

B. Flex duct shall be installed full size of diffuser unless otherwise shown. Maximum length of flexible duct shall not exceed 5′ at diffusers and 2′ at terminal inlets.

C. Where length of diffusers runout exceeds 5′, use low-pressure duct for extension. Secure flexible ductwork at all connections to diffusers, terminals, and round ductwork with UL listed ductstrap. Secure strap over flexible duct liner and cover with duct insulation and vapor barrier jacket.

D. Flex ductwork shall not be used in exhaust or return duct systems unless otherwise noted.

E. Flex ductwork shall be fully extended with no sags or kinks between hard duct and the end use device.

3.07 DUCTS THROUGH FIRE RATED WALLS AND FLOORS

A. Ducts through fire rated walls and floors shall have areas around exterior of duct or insulation sealed with fire barrier material. See Section 23 05 00 Common Work Results HVAC.

3.08 RANGE HOOD EXHAUST DUCTWORK

A. Ductwork shall be all continuously welded with outer joints ground smooth.

B. Provide one 20″ x 20″ access panel for personnel entry. Access panels shall be provided every 12′ with bottom 1½″ above bottom of ductwork, constructed of same material as the ductwork. Access doors shall be gasketed or sealed with 1500°F rated material, bolted to the ductwork with carbon steel studs welded to the surface of the duct. Access panels shall be grease tight.

C. See Section 23 07 00 HVAC Insulation for range hood exhaust duct insulation.

D. Maintain duct clearances to combustibles as per NFPA 96.

E. Perform light testing of all welded joints per paragraph 506.3.2.5 of the International Mechanical Code.

3.09 FIELD-FABRICATED PLENUMS

A. Reinforcing frame shall consist of base angles set on gasket and bolted to foundations. Horizontal and vertical frame angles shall be spaced as per SMACNA requirements. Angles shall be bolted or welded together. Access door openings shall be framed on four sides. Plenum casings shall be bolted, riveted or spot welded to inside surface of angle frame. Seal all joints with gaskets.

B. Plenum doors shall be installed to close with plenum pressure. Install doors on sills, minimum 6″ for 60″ high casing, otherwise 8″.

C. Install finish over liner on all surfaces of plenum.

3.10 ALUMINUM EXHAUST DUCTWORK

A. All aluminum exhaust ductwork shall be watertight using silicon sealed joints. Slope ductwork back to grilles 1/32″/ft. No traps allowed in aluminum exhaust duct systems.

3.11 STAINLESS STEEL DRYER VENT

A. All dryer venting shall be installed with the male slip-in joint facing downstream and without rivets, or screws. All joints shall be continuously welded using the TIG process. Provide tee with removable clean-out cover at the bottom of all vertical rises. For residential type dryers, provide backdraft damper at wall termination.

3.12 DUCT LINER AND FINISH

A. All portions of ductwork or plenums designated to be lined shall be completely covered with duct liner. Fasten duct liner to sheetmetal with coated surface facing the airside and secured with ASTM C916 compliant adhesive with 100% coverage and mechanical fasteners per the requirements of the above-referenced SMACNA standards. Mechanical fasteners shall not compress the insulation more than 1/8″ and shall be spaced per the SMACNA Standards.

B. Metal nosing shall be provided at transverse edge of liner facing the fan discharge when air velocities exceed 2000 F.P.M. or at any point where lined duct is preceded by unlined duct. Locate mechanical fasteners within 3″ of leading edge of liner across entire face. Butt liner joints together to form a continuous liner surface.

C. Any damage to the airside surface must be repaired by coating with duct liner adhesive.

D. Lined duct downstream of terminals shall be covered with two coats of white mastic, but no hardware cloth is required.

E. Lined duct downstream of supply fan outlet in supply air systems to be covered with 18 gauge 304 stainless ½″ hardware cloth. Install Stic-Klips over liner and hardware cloth max. 12″ O.C. each way. Cover entire surface with two coats of white mastic.

3.13 OUTDOOR DUCTWORK

A. All ductwork installed outside shall have provisions to shed water.

B. Any horizontal runs of rectangular/square duct shall have a sloped top to allow rainwater runoff. The sloped top surface can be provided by either a sheet metal cap or sloped insulation.

END OF SECTION 23 31 00

SECTION 23 33 15
FIRE, SMOKE, AND COMBINATION FIRE SMOKE DAMPERS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for fire dampers, smoke dampers, and combination fire smoke dampers.

1.02 RELATED SECTIONS

A. Section 23 01 00 Operation and Maintenance of HVAC Systems

B. Section 23 31 00 Ductwork

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on damper performance including, but not limited to, total static pressure drop verses airflow shown for damper, size, and quantity of dampers required.

C. Provide shop drawing showing dimensions, duct connection sizes, and electrical requirements.

D. Provide manufacturer's instructions; indicate installation and support requirements.

E. Provide operation and maintenance procedures; include testing instructions, assembly drawings, and parts list.

1.04 QUALITY ASSURANCE

A. Fire dampers shall conform to the requirements of UL 555, latest edition.

B. Fire damper shall bear label of the Underwriters Laboratories for 1½-hour rating, unless noted otherwise.

C. Multiple fire/smoke dampers and/or smoke dampers shall be furnished with motors and/or actuators each by the same manufacturer.

PART 2 – PRODUCTS

2.01 FIRE DAMPERS

A. Locations and sizes of fire dampers shall conform to the drawing requirements.

B. Fire dampers shall be curtain type.

C. Fusible links shall break at 165°F maximum unless otherwise noted.

D. Unless otherwise indicated on the drawings, fire dampers in supply ducts shall be the Type B style, in which the stack of open blades is entirely contained within an enclosure above the duct, out of the air stream. Fire dampers in return ducts and exhaust ducts shall be the Type A style, in have blades inside the airstream. Fire dampers shall be manufactured by Air Balance, Greenheck, Nailor, Prefco, Ruskin, or Safe Air.

E. Where noted, fire dampers are to be dynamic type, rated to close in an operating system. Dampers shall be certified to operate at 4" static pressure and 3500 FPM velocity.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Fire dampers shall be installed in accordance with manufacturer's requirements and the SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC, latest edition. Sleeves shall be 20-gauge steel, integral to the damper, and 12″ long. Angles shall be installed as required by SMACNA guide.

B. Smoke dampers and combination fire/smoke dampers shall be installed in accordance with manufacturer's recommendations and requirements of UL 555S.

C. Provide duct access doors at all fire, smoke and fire/smoke damper locations.

D. Combination fire/smoke dampers and smoke dampers shall be tested for proper operation with fans shut down prior to final acceptance. Verify time delay for dampers to close on power interruption of at least 20 seconds.

E. Fire dampers shall not be painted . Paint will impede closure operation.

F. Contractor is responsible for all “closure” testing by the AHJ/Fire Marshall.

END OF SECTION 23 33 15

SECTION 23 34 00
FANS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the miscellaneous fan requirements.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 01 00 Operation and Maintenance of HVAC Systems

C. Section 23 05 00 Common Work Results for HVAC

D. Section 23 05 49 Vibration Isolation

E. Section 23 31 00 Ductwork

F. Section 23 74 17 Metal Building Roof Curbs

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on fan performance including, but not limited to, airflow and total static pressure, and fan motor horsepower.

C. Provide shop drawing showing unit dimensions, weight, electrical requirements, service access requirements, and duct connection sizes and locations.

D. Provide manufacturer's instructions; indicate installation and support requirements.

E. Provide operation and maintenance procedures; include start-up instructions, assembly drawings, and parts list.

1.04 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 211 and AMCA 311. Axijet Fan sizes 1825 and larger bear the AMCA Seal for Sound and Air Performance.

B. Classification for Spark Resistant Construction: Conform to AMCA 99.

C. Each fan shall be tested before shipping. Motors to be tested for amperage drawn.

D. If inverter duty motors are required, see Section 23 05 00 Common Work Results for HVAC for grounding ring requirements.

E. A certificate to be supplied with each fan as to quality control before shipping and compliance to specifications.

F. References:

AMCA 99	Standards Handbook.
AMCA 210	Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
AMCA 211	Certified Ratings Program – Product Rating for Fan Air Performance.
AMCA 300	Reverberant Room Method for Sound Testing of Fans.
AMCA 311	Certified Ratings Program – Product Rating for Fan Sound Performance.
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings.
AMCA 204	Balance Quality and Vibration Levels for Fans.
AMCA 500	Laboratory Methods of Testing Louvers and Dampers for Rating.

PART 2 – PRODUCTS

2.01 ROOF-MOUNTED CENTRIFUGAL FANS

A. Fan housing and wheel shall be spun aluminum, weatherproof construction with corrosion resistant fasteners. Housing shall have removable ½″ square mesh aluminum discharge screen, integral flashing roof curb base, and gravity -operated back-draft damper.

B. Fan motor shall be open drip-proof type, unless otherwise noted. Single-phase motors shall have built-in thermal overload protection.

C. Belt drive shall have cast iron sheaves, with variable pitch motor sheave.

D. Fan drive assembly shall be mounted on vibration isolators.

E. Fans shall be equipped with bird screen, disconnect switch, and backdraft damper.

F. Fans shall be PennBarry, or equivalent fan by Acme, Greenheck, Carnes, Cook, or ILG.

2.02 CENTRIFUGAL IN-LINE FANS

A. Duct mounted supply, exhaust, or return fans shall be of the centrifugal belt driven in-line type. The fan housing shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

B. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

C. Motors shall be heavy-duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase, and enclosure. Motors and drives shall be mounted out of the airstream. Motors shall be readily accessible for maintenance.

D. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed.

E. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

F. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.

G. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

H. Provide optional backdraft dampers and motor fan guard.

I. Fans shall be Greenheck Model BSQ or equivalent by PennBarry, Cook, or ACME.

2.03 HOODED PROPELLER ROOF FANS

A. Fan hood and base construction shall be galvanized steel. Hood panels shall be arched with interlocking ribs and a low style fan base. Hood support angles shall be heavy gauge galvanized steel. Birdscreens of ½″ galvanized mesh shall be horizontally mounted in the discharge perimeter of the hood.

B. Propellers shall be constructed with fabricated aluminum blades and hubs. Propellers shall be securely attached to fan shafts. All propellers shall be statically and dynamically balanced.

C. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase, and enclosure.

D. Drive frame and panel assemblies shall be galvanized steel. Drive frames shall be formed channels and fan panels shall have a deep-formed inlet venturi. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be fully machined cast iron, keyed and securely attached to propeller and motor shafts. Motor sheaves shall be adjustable for system balancing.

E. The axial exhaust, supply, and filtered supply fans shall bear the AMCA Certified Ratings Seals for both sound and air performance.

F. Provide fan inlet safety, backdraft damper, lifting lugs, curb cap stripping, and extended lubrication lines to exterior of fan base.

G. Fans shall be manufactured by Greenheck, or equivalent by PennBarry or Acme.

2.04 UPBLAST RANGE HOOD FAN

A. Roof mounted, spun aluminum fan, UL listed for grease extraction with non-overloading aluminum impeller.

B. Motor shall be continuous duty type mounted outside the contaminated airstream with positive motor covering.

C. Motor and belt drive shall be vibration isolated from the housing.

D. Fan shall be equipped with a birdscreen, extended roof curb, sloped to match the roof as required, and integral grease trough with drain fitting.

E. Fan shall be Acme Centri-Master PUB, PennBarry Fumex, or Greenheck CUBE-HP.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Range hood exhaust fan shall be installed with outlet 40″ above roof minimum.

B. Support cabinet fans and in line fans from the structure with threaded rods and isolators.

C. See drawings for fan scheduled capacities and requirements.

D. Install laboratory exhaust fans as indicated, with resilient mounting and flexible electrical leads. Install flexible connections provided between fan inlet and elbow. Insure minimum 2″ flexible connection between duct and fan. Pipe housing drain to nearest roof drain. Install fans in accordance with manufacturer's instructions. Support fans on "Type 1" vibration isolators, see Section 23 05 49 Vibration Isolation. All fans shall be provided with a local disconnect switch.

END OF SECTION 23 34 00

SECTION 23 37 13
GRILLES, REGISTERS, AND DIFFUSERS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies grilles, registers, and diffusers furnished and installed under Division 23.

1.02 RELATED SECTION

A. Section 23 31 00 Ductwork

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on air distribution performance including, but not limited to, total static pressure drop and sound generation (NC) verses airflow shown for each supply and return grille, size, and quantity of grilles required.

C. Provide shop drawing showing catalog illustrations, dimensions, duct connection sizes, and accessories.

D. Provide manufacturer’s instructions; indicate installation and support requirements.

1.04 QUALITY ASSURANCE

A. Performance of grilles, registers, and diffusers shall be tested in accordance with ANSI/ASHRAE Standard 70, latest edition.

B. All grilles, registers, and diffusers shall be selected and furnished by one manufacturer.

PART 2 – PRODUCTS

2.01 GENERAL

A. Grilles, registers, and diffusers have been selected from one manufacturer's catalog. Alternate manufacturers shall be Titus, Metalaire, E. H. Price, Krueger, Carnes, Anemostat, Tuttle & Bailey, or Nailor Industries.

B. All grilles and registers with borders shall be furnished with gasketed seals around the perimeter. All grilles, registers, and diffusers shall be aluminum or steel, as scheduled.

C. Register dampers shall be gang operated opposed blade type, operable through the face of the diffuser.

D. Extractors shall be gang operated with galvanized steel construction, 2″ blade spacing, fully adjustable blades, with thru key operated screw at different face, Titus AG-225 with operator #3.

E. Door grilles shall be sight proof, aluminum offset blade type with adjustable frame, Titus CT-700.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Attach ceiling diffusers to flex duct connection in a secure fashion with sheet metal straps screwed in place or tightly secured UL listed draw bands.

B. Install offset return grilles so that blade offset is angled down towards the floor.

C. Coordinate exact location of ceiling diffusers and grilles with reflected ceiling plan.

END OF SECTION 23 37 13

SECTION 23 38 13
RANGE HOOD

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the range hood and fire extinguishing system.

1.02 RELATED SECTIONS

A. Division 23 Section “General Provisions HVAC”

B. Division 23 Section “Ductwork Insulation”

C. Division 23 Section “Ductwork”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide data on hood performance including, but not limited to, hood airflow and associated pressure loss.

C. Provide Shop Drawing showing unit dimensions, weight, electrical requirements, service access requirements and duct connection sizes and locations.

D. Provide manufacturer’s instructions, indicate installation and support requirements.

E. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. Range hood shall be factory fabricated UL listed, and constructed per NFPA 96A, 1994.

B. Fire protection system shall be factory installed and shall meet the requirements of UL 300 standard.

PART 2 – PRODUCTS

2.01 RANGE HOOD

A. Hood exterior and exposed interior surface including the filter housing shall be constructed of 18 gauge type 304 stainless steel with a No. 4 finish. Construction shall be continuous all liquid tight welded and ground smooth. Unexposed interior surfaces shall be constructed of a minimum 18 gauge corrosion resistant steel including, but not limited to ducts, plenum and brackets. The hood shall include UL listed stainless steel grease extractors, removable for cleaning unless a permanent part of the hood, draining to a grease collecting trough and removable container.

B. The hood shall include UL listed stainless steel grease baffle filters, removable for cleaning unless a permanent part of the hood, draining to a grease collecting trough and removable container.

C. The hood shall be provided with recessed 100 watt incandescent UL listed light fixtures mounted in vapor tight enclosures, prewired to a single junction box on top of the hood for power connections.

D. Provide complete UL300 UL 300 listed automatic wet chemical fire cable activated protection system.

1. The hood shall be completely prepiped with a UL 300 listed automatic wet chemical fire cable activated protection system, including outlets under the hood, duct outlets, conduit piping, cables, manual pull stations, fire links.

2. Provide normally closed manual reset gas shutoff valve for cooking equipment and a double-pole, double-throw microswitch to shut off electrical appliance, auxiliary contacts for remote fire alarm monitor, and chemical storage tanks.
3. Manufacturer hood mounted fire system hook up to consist of installation of tank, controls, routing of piping including but not limited to hook-up of detection lines, and supply lines, mount and hook-up remote manual pull, hook-up mechanical gas valve/electrical shut-off device, charge and tag system.
4. All piping run in the hood to be concealed and all piping extending into duct and plenum nozzles are to be fitted with grease tight joints at penetration. Exposed nozzle piping to be Schedule 40 stainless steel with chrome plated fittings. System shall be by Ansul, Kidde Fenwal, or Pyro Chem.

E. Hood shall be Greenheck (Accurex), or equivalent by GreaseMaster, Sunair, or Gaylord.

PART 3 – EXECUTION

3.01 GENERAL

A. Coordinate final ductwork requirements with hood actually furnished.

B. Mount hood a minimum of 6'-6" above finished floor.

C. Automatic wet chemical system shall be installed by a distributor certified by the wet chemical manufacturer, including a minimum of two visits (system installation and test). Include all permit and puff test fees.

END OF SECTION 23 38 13

SECTION 23 72 23
TEMPERING ENERGY RECOVERY UNIT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for both rooftop and indoor Tempering Energy Recovery Ventilator (TERV) units.

1.02 RELATED SECTIONS:

A. Division 23 Section “General Provisions HVAC”

B. Division 23 Section “Operation and Maintenance of HVAC Systems”

C. Division 23 Section “Vibration Isolation”

D. Division 23 Section “Refrigerant Piping and Accessories”

E. Division 23 Section “Ductwork”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide data on unit performance including, but not limited to, entering and leaving air temperatures, airflow and total static pressure, fan motor horsepower, total and sensible heat recovery, cooling coil capacity and heating section capacity.

C. Provide Shop Drawing showing unit dimensions, weight, electrical requirements, service access requirements and duct connection sizes and locations.

D. Provide manufacturer’s instructions, indicate installation and support requirements.

E. Provide operation and maintenance data; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. Unit shall be carry UL label of approval and bear AMCA certified rating seals for air performance.

B. The ERV manufacturer shall provide a one-year warranty minimum on all parts. Enthalpy wheels shall carry a 5-year warranty.

PART 2 – PRODUCTS

2.01 TEMPERING ENERGY RECOVERY VENTILATORS

A. Tempering Energy Recovery Ventilators (TERV) shall be enthalpy-type, air to air heat exchangers utilizing desiccant-type heat wheels. Units shall include motorized heat wheel assembly, outside air supply fan, exhaust fan, supply filter, motorized by-pass damper, cooling and heating section as scheduled, variable speed drive (when scheduled), pre-wired single point electrical connection, motor starter with thermal overload protection, disconnect switch and 24 volt controls with dry contacts for interface with building automation system. TERV’s shall be either indoor or rooftop mounted as scheduled on the Drawings. Minimum summer heat wheel design efficiency shall be 80%.

B. Housing shall be heavy gage galvanized steel with 1" rigid board fiberglass insulation with foil facing. Maximum unit height shall not exceed 8'-6". Hinged and gasketed access doors shall be provided for both supply and exhaust fan compartments. Heat wheel shall be easily accessible for inspection, removal and cleaning. Units scheduled for rooftop installation shall have weather resistant gasketing and seals and housing shall be suitable for outdoor installations.

C. Supply fan shall be arranged for blow through configuration and exhaust fan for draw through. Fans shall be forward curved type, statically and dynamically balanced at the factory prior to shipment. Adjustable sheaves shall be provided for independent balancing of supply and exhaust.

D. Motors shall be high-efficiency, heavy-duty type, furnished at specified voltage and phase. Bearings shall be selected for minimum (L10) life in excess 100,000 hours.

E. Filters shall be provided upstream of the supply fan and upstream of the exhaust side of the heat wheel. Filters shall be 2" thick UL listed Class 2 type with a minimum MERV 13 Rating. Filters shall be Airguard, American Air Filter, Farr or equal.

F. Airflow direction and inlet and outlet locations shall be as shown on Drawings. Indoor TERVs shall have provisions for suspending from ceiling and mounting on floor. Rooftop TERVs shall include supply and exhaust weather hoods to prevent water entry.

G. Rooftop TERVs shall include a full perimeter type roof curb supplied by unit manufacturer for field assembly. Curb shall be 12" high (minimum) insulated, with raised cant.

H. Direct expansion TERV's shall include the following:

1. Refrigerant coils shall be direct expansion type with a total capacity as scheduled. Coils shall be constructed with aluminum plate fins mechanically bonded to non-ferrous tubing with all joints brazed. Coil shall have factory installed refrigerant metering device, refrigerant line fittings that permit mechanical connections and pitched condensate drain pan designed to prevent standing water. Provide controls to maintain coil leaving air temperature setpoint.
2. Aircooled compressorized condensing section shall be integral to the TERV and include hermetic reciprocating or scroll compressors, 1750 rpm, vibration isolated and crankcase heater protected. Compressor shall be thermal overload protected. Condenser coils shall have copper tubes with mechanically bonded aluminum fins. Coils shall be factory pressure and leak tested. Refrigerant circuits shall be completely pre-piped and tested with sight glasses, suction and liquid accumulators. Provide a minimum of two stages of cooling. Condenser fans shall be statically and dynamically balanced direct driven motors with thermal overload protection.
3. Hot gas reheat coils shall be direct expansion type with a total capacity as scheduled. Coils shall be constructed with aluminum plate fins mechanically bonded to non-ferrous tubing with all joints brazed. Coil shall have factory installed refrigerant flow control device and controls to maintain coil leaving air temperature setpoint.

I. Indirect fired gas furnace shall be 80% efficient, UL Certified and Listed to ANSI Standard Z83.8 - 1996, CGA approved per 2.6 - M96 and have a blow through fan design. Furnace shall be capable of operation with natural gas and have a power venting system. The burner and heat exchanger shall be constructed of aluminized steel. Standard furnace features shall include main gas pressure regulator, main gas valve, electronic staging, electronic intermittent pilot ignition, high limit and a 24-volt control transformer.

J. Motorized exhaust air damper shall open when unit is operating. Units with direct expansion cooling coils shall include a motorized modulating return air damper and motorized modulating outside air damper interlocked to maintain constant airflow. VERIFY MANUFACTURERS

K. TERVs shall be manufactured by Trane, no other manufacturer allowed for this project .

3.01 INSTALLATION

A. See the Drawings for scheduled capacities and requirements.

B. Install TERV units per manufacturer's installation instructions.

END OF SECTION 23 72 23

SECTION 23 74 15
UNITARY AIR CONDITIONING UNIT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for unitary air conditioning units.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 01 00 Operation and Maintenance of HVAC Systems

C. Section 23 05 00 Common Work Results for HVAC

D. Section 23 31 00 Ductwork

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on unit performance including, but not limited to, entering air temperatures, airflow, external and total static pressure, supply fan motor horsepower, total and sensible capacity, applicable ARI SEER, EER and IPLV values.

C. Provide shop drawing showing unit dimensions, weight, electrical requirements, service access requirements and duct connection sizes and locations.

D. Provide manufacturer's instructions, indicate installation and support requirements.

E. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. Units shall be factory run tested.

B. Cooling capacities shall be rated in accordance with the applicable ARI Standard: ARI 210/240 or ARI 340/360.

1.05 EXTENDED WARRANTY

A. All compressors shall have extended compressor warranty for four years after the completion of the one-year initial warranty.

PART 2 – PRODUCTS

2.01 UNITARY AIR CONDITIONING UNITS 6 TONS AND SMALLER

A. Units shall be factory fabricated, tested and assembled single zone constant volume direct expansion type complete with compressor, condenser fan, evaporator fan, filters, weatherproof housing, scheduled heating section, controls and piping ready for operation. Units shall be configured for supply and return duct connections as shown on the drawings.

B. Casing shall be phosphatized steel finished with an enamel or galvanized paint. Service panels shall be provided to access filters, supply fan and control sections. Other interior components shall be accessible through gasketed removable panels. All interior sections of casing in contact with the airstream shall be insulated with 1" thick mat faced fiberglass insulation.

C. Curb shall be built in accordance with National Roofing Contractors Guidelines, constructed of minimum 14-gauge steel and finished in galvanized or baked enamel paint. Gasketing shall be provided between casing and the curb.

D. Gas heating section shall have a corrosion resistant heat exchanger with forced combustion blower and pilotless ignition, suitable for use with natural gas. Provide a single stage of heat.

E. Unit shall utilize R-410a refrigerant.

F. Refrigeration system shall include hermetic reciprocating or scroll compressors, 1750 rpm, vibration isolated and crankcase heater protected. Compressor shall be thermal overload protected. Evaporator and condenser coils shall have copper tubes with mechanically bonded aluminum fins. Coils shall be factory pressure and leak tested. Evaporator coil shall utilize fixed orifice expansion device. Circuits shall be completely pre-piped and tested with sight glasses, refrigerant filter driers, suction and liquid accumulators.

G. Condenser fan shall be statically and dynamically balanced direct driven motors with thermal overload protection. Evaporator fan shall be forward curved direct drive type. Fan shall be statically and dynamically balanced. Supply fan shall be driven by high efficiency motor.

H. Filters shall be 2" thick UL listed Class 2 type with a minimum MERV 6 Rating (ASHRAE 52.2-1999) with not more than a 0.25" initial pressure loss at 500 FPM face velocity. Filters shall be Airguard DP40, American Air Filter AM-200E, Farr 30/30 or equal.

I. Units shall be furnished with motorized 25% outside air damper. Damper shall open to provide scheduled minimum outside air when supply fan runs, and close when supply fan is off, or when unit is operating in un-occupied mode.

J. Controls shall include high and low-pressure cutouts for compressor, complete economizer change over and mixed air control sequencing mechanical cooling as required, electronic supply air control to reset supply air temperature based on outdoor air, anti-recycle timers on cooling steps, and keep outside air damper closed during "warm up" cycle.

K. Units shall be completely prewired with all internal fuses, contactors and controls terminated in a single point power connection, suitable for single point service disconnect.

L. Units installed on the roof shall be equipped for through the curb power and control wiring connections.

M. Units shall be provided with a factory installed photoelectric type smoke detector in the supply air section when scheduled or shown on the drawings. Detector shall be wired to stop the supply fan upon activation.

N. Unitary air-cooled air conditioners shall meet or exceed ASHRAE 90.1-2004 and DOE mandated Performance Requirements:

<65,000 BTUH, Min Efficiency = 12.0 SEER for 3-phase equipment
<65,000 BTUH, Min Efficiency = 13.0 SEER for 1-phase equipment
≥65,000 BTUH but < 135,000 BTUH, Min Efficiency = 10.3 EER*
*Deduct 0.2 from the required EER/IPLV for units with a heating section other than electric resistance.

O. Warm air furnaces/air conditioning units shall meet or exceed ASHRAE 90.1-2004 Performance Requirements:

<225,000 BTUH Min. Efficiency = 78% AFUE or 80% thermal efficiency, Et

P. See drawing schedule for capacities. Units shall be Trane, JCI, Carrier, or Daiken.

PART 3 – EXECUTION

3.01 CONDENSATE DRAINS

A. Pipe condensate drains full size with galvanized pipe union, and trap to a point three feet away from the unit, and terminate on the roof. Support with treated wood 2" x 4" blocks on roof and secure with galvanized straps.

3.02 CURBS

A. Install roof curbs and units level. Do not remove deck inside curbs except for duct openings. Seal openings between duct roof penetration and deck with duct sealer and insulate entire interior of curb under unit with 4" thick 3 lb density duct liner.

END OF SECTION 23 74 15

SECTION 23 81 26
DIRECT EXPANSION EQUIPMENT, HEAT PUMPS AND GAS FIRED HEATING EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for the split system air conditioners and heat pumps (up to 10 tons) and gas-fired heating equipment.

1.02 RELATED SECTIONS

A. Section 23 00 10 General Provisions HVAC

B. Section 23 01 00 Operation and Maintenance of HVAC Systems

C. Section 23 05 48 Seismic Restraints

D. Section 23 23 00 Refrigerant Piping and Accessories.

E. Section 23 31 00 Ductwork

1.03 SUBMITTALS

A. See General Conditions for submittal procedure.

B. Provide data on unit performance including, but not limited to, entering air temperatures, airflow and total static pressure, supply fan motor horsepower, total and sensible capacity, applicable AHRI SEER, EER, IEER values.

C. Provide shop drawing showing unit dimensions, weight, electrical requirements, service access requirements and duct connection sizes and locations.

D. Provide manufacturer's instructions, indicate installation and support requirements.

E. Provide manufacturer's certificate indicating that the unit's construction meets or exceeds the seismic force requirements as specified in Section 23 05 48 Seismic Restraints.

F. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. All unit wiring shall be completely factory installed and shall comply with the requirements of the National Electrical Code.

B. All gas fired furnaces and duct heaters shall be CSA International approved. All heat pumps and condensing units shall be UL listed.

1.05 GUARANTEE

A. Provide an additional four-year warranty on each compressor after expiration of the standard one-year warranty.

B. Ductless split systems shall have a 5-year warranty on parts and a 7 year warranty on compressors.

PART 2 – PRODUCTS

2.01 INFRARED GAS RADIANT HEATERS

A. Unit heaters shall be natural gas fired tube-type, including emitter tube, heavy-duty cast iron burner with negative pressure operation, CSA design certified for vertical or horizontal venting, ignition system with 100% shut-off system, aluminum reflectors and control system with thermostat.

B. Unit shall be design certified by CSA to ANS Z83.20/CSA 2.34 with a written warranty covering the burner for 10 years, the emitter tube for 5 years and a 1 year warranty for the control assembly.

C. Units shall be vented to the exterior of the building.

1. Vent pipe shall be minimum 26 gauge single wall vent pipe sized as shown on plan with type “B” vent for the portion of the vent passing through the wall.
2. Provide approved horizontal wall vent terminal. Schwant JA-0529 or approved equal.

D. Heaters shall be Schwank STS-JZ or equivalent by AmbiRad or SpaceRay.

2.02 SPLIT SYSTEM INDOOR SECTION

A. Units shall be configured as shown on the plans or schedule.

B. Fans shall be forward curved type. All fans shall be statically and dynamically balanced and run tested in the unit casing.

C. The multi-speed fan motor shall be totally enclosed, factory lubricated, and shall have internal thermal overload protection.

D. Unit enclosure shall be insulated and constructed of cold-rolled steel and finished with baked enamel. Front access panels shall provide access to all components.

E. Units shall be prewired for a single point power source of voltage scheduled.

F. Coils shall be direct expansion type with a total capacity as scheduled. Coils shall be constructed with aluminum plate fins mechanically bonded to nonferrous tubing with all joints brazed. Coil shall have factory installed refrigerant metering device, refrigerant line fittings which permit mechanical connections and condensate pan with drain connection.

G. Provide a section for low velocity throwaway filter(s). Filters shall be 1" thick UL listed disposable fiberglass type with scrim reinforced media and a minimum MERV 1 Rating (ASHRAE 52.2-1999) with not more than a 0.2" initial pressure loss at 500 FPM face velocity. Filters shall be Airguard F312, American Air Filter Stratadensity, or equal.

H. Electric heater shall be factory installed on unit. All heaters shall be equipped with thermal overload device, current overload protection and the required heating and cooling system controls to operate resistant heat at outside temperatures below 30°F. The controls shall lockout the heat pump compressor when electric heat is on.

I. Air units shall be Carrier or equal by Trane or York.

2.03 SPLIT SYSTEM HEAT PUMP, OUTDOOR SECTION

A. Outdoor unit shall be equipped with galvanized or baked enamel steel casing suitable for exposure to the weather.

B. Unit shall be complete with high efficiency spring isolated compressor with thermal overload protection and crankcase heater; direct drive condenser fan and motor; accumulator; and reversing valve. Units over 7½ tons size shall be provided with electric cylinder unloading or two separate refrigeration circuits.

C. Capacity shall match air unit at 95°F ambient outdoors and 45°F suction temperature. Unit shall be of the same manufacturer as the air handling unit.

D. Accessories shall include liquid line solenoid valve, filter drier, solid state anti-recycle timer, low pressure switch, start relay capacitor kit, low ambient to 0°F and defrost cycle control.

E. Compressor shall have an additional four-year warranty after expiration of the standard one-year warranty.

F. Unit shall utilize HCFC free refrigerant R410A.

G. Air cooled Heat Pumps shall meet or exceed ASHRAE 90.1(current edition) [or IECC (current edition)] and DOE mandated Performance Requirements:

<65,000 BTUH, Min Efficiency = 14.0 SEER cooling and 8.2 HSPF
≥65,000 BTUH but < 135,000 BTUH, Min Efficiency = 11.0 EER* cooling, 12.0 IEER* cooling, and 3.3 COP** heating
* Deduct 0.2 from the required EER/IEER for units with a heating section other than electric resistance.
**Based on 47°F DB / 43°F WB outdoor air.

H. Unit shall be Carrier or equal by Trane or York.

2.04 DUCTLESS SPLIT SYSTEM UNITS

A. Units shall be configured as shown on the plans or schedule.

B. Units configured for wall mounting shall include a two speed direct drive fan and blower assembly, washable filter, adjustable diffuser, DX type copper coil, drain pan and single point power connection, all housed in an enclosure intended for wall mounting with the conditioned space.

C. Units configured for recessed ceilings mounting shall include a two speed direct drive fan and blower assembly, washable filter, adjustable diffuser, DX type copper coil, drain pan and single point power connection, all housed in an enclosure intended for mounting above a lay-in type ceiling.

D. Units configured for ducted application shall include a two speed direct drive fan and blower assembly, washable filter, adjustable diffuser, DX type copper coil, drain pan and single point power connection, all housed in an enclosure intended for mounting above an accessible ceiling.

E. Heat pump indoor units shall also include supplemental electric heater coil.

F. Outdoor cooling only condensing units shall consist of a galvanized steel waterproof cabinet with baked enamel finish, coil and fan guards, spring mount hermetic compressor, condenser fan, fan motor, condenser coil, compressor contactor, and operating controls. Compressors shall include a five year warranty, high pressure switch, crankcase heater, and internal overload thermostat. Unit shall utilize R410A refrigerant.

G. Outdoor heat pump units shall consist of a galvanized steel waterproof cabinet with baked enamel finish, coil and fan guards, spring mount hermetic compressor, condenser fan, fan motor, condenser coil, reversing valve and operating controls. Compressors shall include a five year warranty, high pressure switch, crankcase heater, and internal overload thermostat. Unit shall utilize R410A refrigerant.

H. Unit controls shall consist of a wired remote controller with set point adjustment, room temperature display, auto restart after power interruption, and shall stage unit to maintain set point.

I. Unit shall include accessories and controls to provide reliable cooling mode operation in ambient temperatures down to 0ºF (low ambient controls).

J. Air cooled air conditioners and heat pumps shall meet or exceed ASHRAE 90.1(current edition) [or IECC (current edition)] and DOE mandated Performance Requirements:

<65,000 BTUH, Min Efficiency = 14.0 SEER cooling and 8.2 HSPF

K. Units shall be or equal by Daikin, LG, Samsung, or Mitsubishi.

2.05 CONDENSATE DRAINS

A. Condensate drains shall be type M copper with traps, vents and unions piped to floor drains or other location as shown on drawings.

PART 3 – EXECUTION

3.01 GENERAL

A. Provide the owner with one spare set of filters for each indoor unit at the final inspection.

B. Adjust vibration isolators supporting units after operation of equipment begins. Secure isolators to supports when finally set.

C. The furnaces, unit heaters, fan coil units, and condensing units, together with all connections, shall be installed in accordance with the manufacturer's recommendations.

D. Provide refrigerant and oil.

3.02 REFRIGERANT HANDLING

A. Intentional release of refrigerant to the atmosphere shall not be allowed. Any work requiring removal of refrigerant shall be accomplished with a recovery unit.

3.03 SYSTEM CHARGING

A. Install core in filter dryers after leak test but before evacuation.

B. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

C. Break vacuum with refrigerant gas, allowing pressure to build.

END OF SECTION 23 81 26

SECTION 23 82 37
MISCELLANEOUS ELECTRIC HEATERS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for electric heating equipment and heat tape.

1.02 RELATED SECTIONS:

A. Division 23 Section “General Provisions HVAC”

B. Division 23 Section “Operation and Maintenance of HVAC Systems”

C. Division 23 Section “Common Work Results for HVAC”

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide data on heater performance including, but not limited to, entering and leaving air temperatures, capacity, and airflow.

C. Provide Shop Drawing showing heater dimensions, weight, service access requirements and electrical requirements.

D. Provide manufacturer’s instructions, indicate installation and support requirements.

E. Provide operation and maintenance procedures; include start-up instructions, assembly drawings and parts list.

1.04 QUALITY ASSURANCE

A. All electric heating equipment shall be UL listed and so labeled.

B. Unit heaters, cabinet heaters and wall heaters shall be the products of one manufacturer.

PART 2 – PRODUCTS

2.01 ELECTRIC DUCT HEATERS

A. Electric duct heater sizes and electrical characteristics shall be as scheduled. Heaters shall be open coil resistance wire slip-in type with electrical components factory installed in an insulated electrical panel.

B. The frame, panel and supports shall be constructed of aluminized or galvanized steel.

C. Control panel door shall be hinged and latched, and provided with dust tight gasket.

D. Heating elements shall be 80% nickel, 20% chromium coil mounted with phenolic or ceramic insulators and have ceramic bushings, steel supports and fasteners.

E. Stages shall be equal wattage and have balanced circuits on the electrical supply phases. Coils rated at more than 48 amps shall have heating elements subdivided. Heater stages shall be wired so that each stage element covers the full face of the coil.

F. Electrical components shall include:

1. Terminal blocks for control and power wiring.
2. Fuses and fuse blocks for each ungrounded connector.

3. Magnetic contactors for each circuit to disconnect all ungrounded conductors with silver alloy contacts.
4. Primary thermal cutout: Automatic reset type.
5. Secondary thermal cutout: Manual reset type. Heat limiters or fusible links are not acceptable.
6. Dry Type Control Transformer with fused primary and fused secondary with voltage based on the controls system.
7. Disconnect switch mounted on face of the hinged panel door.
8. Diaphragm operated differential pressure switch.

G. Manufacturers: Brasch, Indeeco, Nailor Ind., or Raywall.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install heaters in accordance with manufacturer's UL listing for minimum clearance.

3.02 DUCT HEATERS

A. Connections to ductwork shall be air tight. Install heaters so that panel door will open fully.

END OF SECTION 23 82 37

SECTION 26 00 00

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE

A This section applies to all Sections of Division 26 00 00 – Electrical General Provisions.

B The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section and in all sections of this division.

1.02 WORK INCLUDED

A Provide all labor, tools, and materials required for a complete and fully operational installation, as described on the Drawings or in the Specifications.

B The work shall be installed in a neat and workmanlike manner.

1.03 WORK NOT INCLUDED UNDER DIVISION 26 00 00

A The following items of work are specified under other divisions of the specifications:

1. Temporary service for construction.
2. Electric motors.
3. Electric heaters unless otherwise noted on the Drawings.
4. Control and interlock wiring for work furnished under other divisions, except where specifically required under this division.
5. Access panels in walls or ceilings.
6. Field finish painting, except for field painting of electrical material with paint supplied by the manufacturer of the material.
7. Starters for certain items of equipment are furnished under other divisions for installation under this division.

B Refer to other sections of this division for work required in connection with the above items.

1.04 DEFINITIONS

A “Provide”: furnish and install, complete and ready for operation.

B “Install”: receive, mount, and connect, complete and ready for operation.

C “Wiring”: wires and cables installed with all required raceways, connectors, and fittings.

D “Concealed”: not exposed to view; embedded in masonry or other construction; in furred spaces or above suspended ceilings; below grade.

E “Exposed”: not concealed; not embedded or installed underground; under raised floors; inside trenches, tunnels, basements, inside built-up HVAC equipment, crawl spaces, and accessible attics.

F “The Drawings”: that portion of the Contract Drawings annotated as electrical.

G “Furnish”: Supply, deliver to job site, protect and store.

1.05 ABBREVIATIONS

A The abbreviations used on the Drawings and in the Specification are defined as follows:

1. "AC": Alternating Current
2. "AFF": Height above Finished Floor
3. "AIC": Ampere Interrupting Capacity
4. "AICR": Ampere Interrupting Current Rating
5. "AHJ": Authority Having Jurisdiction
6. "NEC": National Electrical Code
7. "NIC": Not in the Contract
8. "NF": or "N/F": Non-fused
9. "30A/2P": Example of a circuit designation for a 30 Amp 2-Pole fused switch or a 30 Amp 2-Pole circuit breaker or device.
10. "FBO": Furnished by Others
11. "EC": Electrical Contractor
12. "EX": Existing to Remain
13. "EXR": Existing Relocated – new location indicated on the Drawings.
14. "HP": Horsepower
15. "kVA": Kilovolt Ampere
16. "kW": Kilowatt
17. "MCC": Motor Control Center
18. "MLO": Main Lugs Only
19. "NTS": Not to Scale
20. "WP": Weatherproof

1.06 CODES, RULES, AND REGULATIONS

A Comply with the following:

1. ASHRAE 90.1 – 2013.
2. Local codes enforced by the local inspection authority.
3. The edition of the National Electrical Code being enforced for this Project by the local inspection authority.
4. All applicable laws and ordinances.
5. The rules and regulations of electric utility company serving the Project applicable to the installation of service and metering equipment.
6. The rules and regulations of the telephone company serving the Project applicable to the work required for routing telephone service into the facility.

B Give all necessary notices, obtain all required permits, and pay all inspection and other fees imposed by Authorities Having Jurisdiction over the work.

1.07 STANDARDS

A The standards of the following organizations shall be applicable to the work:

1. The National Fire Protection Association (NFPA)
2. Underwriters Laboratories (U/L)
3. National Electrical Manufacturers Association (NEMA)
4. American National Standards Institute (ANSI)
5. Institute of Electrical and Electronic Engineers (IEEE)
6. Insulated Power Cable Engineers Association (IPECA)
7. Illuminating Engineering Society of North America (IESNA)
8. National Electrical Testing Association (NETA)
9. National Electrical Contractors Association (NECA), Standard of Installation
10. American Society for Testing and Materials (ASTM)

B Comply with the latest editions of standards applicable to the work.

1.08 MATERIALS

A All material shall be new, and shall comply with the indicated standards.

B All material shall be UL labeled or UL listed, except where the material is of a type not included in the UL listing service, in which case the material shall comply with other applicable industry standards and the Contractor shall provide any examinations or certifications required by the local inspection authority in lieu of UL listing.

C All material shall be of a suitable type and rating for the intended use, and shall be installed in conformance with the instructions and recommendations of the manufacturer.

1.09 DRAWINGS

A The Drawings are schematic in nature and do not indicate all of the required details of the work. All materials customarily considered to be a part of the electrical work and normally required for a complete and operational installation, shall be provided without additional cost to the Owner.

B Refer also to the Drawings of all other trades to coordinate the electrical installation.

C Equipment of other trades is shown schematically on the electrical Drawings. Examine the Drawings of the trade providing the equipment before roughing in the connections for it. Connect the equipment where actually installed, including wiring through any line voltage controllers, without any additional cost to the Owner.

D Prior to roughing in circuits for equipment furnished by other trades, and prior to releasing for manufacture panelboards, starters or motor control centers feeding such equipment coordinate the electrical provisions being planned with the trade providing the equipment and submit any conflicts in writing.

E The Architect or the Architect's Engineer directs the location of any electrical outlet, or wall switch, or luminaries, or other equipment, to a location within 10 feet of the location shown on the Drawings at no additional cost to the Owner provided such relocation is made prior to the installation of the equipment being relocated.

1.10 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Submittals are required for material as noted in other sections of this division.

C Check shop Drawings prior to submission and provide date and signature of checker on each item. Note all corrections. Note any requested deviation from the Drawings or specifications, or if none, then so indicate. The Architect shall return Documents without review where submitted without prior review by the Contractor.

D Review of submittals will be only for general conformance with the design concept indicated on the Drawings and in the Specifications and general compliance with the information given in the Contract Documents. Review will be made only of information clearly and specifically indicated in the submittal, and does not imply the acceptability of details, which are not so described in the submittal. Approval of a specific item shall not include approval of an assembly of which the item is a component. Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the Work of all trades; and performing all work in a satisfactory manner.

E Review of the submittal documents by the Architect does not relieve the Contractor of the responsibility to comply with all requirements of the Contract Documents.

1.11 PROJECT CLOSEOUT

A Furnish Closeout Documents in the manner and form described in Specification Section 01 77 00 Contract Closeout.

B Closeout Documents shall include the following:

1. Final shop Drawings.
2. As-built Drawings including as-built field layout Drawings.
3. Operation and maintenance manuals.
4. Receipts from the Owner stating that he has received satisfactory operational demonstrations and instruction for electrical systems.
5. Signed receipts from the Owner for spare parts and materials that are specified to be furnished.
6. Written guarantee.
7. All required certifications, including certificate of inspection approval of the code-enforcing authority.
8. All required test reports (include in operations and maintenance manual).

1.12 AS-BUILT DRAWINGS

A. Provide as-built Drawings in the manner and form described in Specification Section 01 81 00 Project Record Documents.

B. As-built Drawings shall be maintained at the jobsite, and shall be available for review during construction.

C Record the final arrangement of the work and exact locations of the work as installed. Provide photographs of buried grounding work prior to backfill of trenches.

D As-built Drawings shall be kept current during the course of construction of the work.

1.13 OPERATION AND MAINTENCE MANUALS

A. Provide minimum of three (3) copies of operation and maintenance manuals in the manner and form described in Specification Section 01 78 20 Operations and Maintenance Data. Manuals shall be typewritten, indexed, tabbed, and loose leaf bound in heavy duty 3-ring binders.

E Manuals shall include the following:

1. Operating instructions customized to this specific Project
2. Maintenance instructions
3. Parts list
4. Descriptive literature
5. Location, telephone number and contact information of Contractors, distributors, dealers and authorized service agents.
6. Test reports and certifications.
7. Record copies of all shop or submittal Drawings and data
8. Copies of all software on diskette or compact disk, licensed to the Owner.

F Maintenance instructions and parts lists shall include the most detailed and advanced publications available from the equipment manufacturer.

G Demonstrate the operation of the equipment to the Owner, including instruction in its use and operation. Provide instruction by manufacturers representatives where specified.

H Provide operation and maintenance manuals for equipment and systems as specifically by the sections in Division 26 00 00.

1.14 SPARE PARTS

A Furnish spare parts as specified by the sections in Division 26 00 00.

B Turn over spare parts to Owner's representative. Store on site as directed by the Owner. Obtain written receipt detailing specific spare parts turned over and submit with Closeout Documents.

C Replace at no cost to the Owner any spare parts used from the Owners stock prior to Substantial Completion or for warranty related repairs.

1.15 GENERAL TESTING

A Test all parts of the work to verify compliance with the Drawings and Specifications.

B Verify tightness of all mechanical and electrical connections.

C Verify integrity of all wiring systems to assure continuity, absence of unintentional grounds, and integrity of required grounds.

D Perform any required special factory or field testing as specified in the other sections of this division. Provide all wiring, instruments, and personnel required to complete these tests.

E Where other requirements of this division require testing in the presence of the Architect, provide at least seven (7) business days advance written notice of such testing to the Architect.

F Where other requirements of this division require submission of written records of tests and test results, accumulate and submit all such reports and include as a separate section in the operations and maintenance manuals described elsewhere in this section.

END OF SECTION 26 00 00

SECTION 26 05 00

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 GENERAL

A This section covers items of work required by more than one section of Division 26 00 00 – Electrical General Provisions.

B Refer to other Divisions for requirements pertaining to:

1. Cutting and repairing
2. Excavation and backfilling
3. Concrete
4. Field painting
5. Equipment furnished under other Divisions and installed under this Division

1.02 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Required for fireproofing system materials and

C Provide manufacturer's data sheets with complete description of all components, catalog numbers, specific details of applicable UL listings, and detailed line drawings of fireproofing methodology to be used for each type of penetration.

PART 2 - PRODUCTS

2.01 MANUFACTURE

A Concrete Inserts: Grinnell, Kindorf, Unistrut, B-Line or Hohmann & Barnard.

B Drilled Anchors: All metal; heavy duty, non-caulking, expansion bolt anchor equivalent to Rawl #9650 Series or Red-Head, Hilti or Grinnell. Minimum size used shall be ¼" machine thread.

C Metal Framing Channel: 1-5/8" x 1-5/8", 12 Gauge, equivalent to Kindorf, Unistrut, B-Line, Power-Strut, or Super-Strut. Use appropriate fittings of same manufacture.

2.02 WOOD BACKBOARDS

A Wood backboards shall be ¾" thick, grade B-C, plywood. Paint with gray color fire-retardant paint.

B Use backboards only in interior spaces and sized as indicated on the Drawings.

2.03 NAMEPLATES

A Provide engraved plastic equipment nameplates for all switchboards, panelboards, motor control centers, starters, disconnects, primary selector switches, time clock controls, contactors, and transformers.

B A circuit nameplate indicating circuit number and the equipment served shall be provided for each feeder in service switchboard, and each branch device in power distribution panels, and motor control centers.

C Distribution equipment nameplates shall state equipment designation, ampere rating, voltage and phase, and “fed from (name)”.

D Nameplates for individually mounted starters, safety switches, etc., shall state load served, circuit number, voltage and phase.

E Refer also to Section 26 27 26 “Wiring Devices” for additional requirements pertaining to Wiring Device labeling.

F Refer also to Section 26 05 53 “Electrical Identification” for additional Electrical Identification requirements.

2.04 FIREPROOFING

A All fireproofing materials shall be the product of one manufacturer and shall be U.L. listed for the type of application where applied.

B Provide caulk, expanding foam, putty, rigid boards, tape and packing as required by the U.L. listing for the type of penetration being fireproofed.

C Fireproofing of sleeves, cable trays, troughs, and nipples to be used for low voltage cables shall be indefinitely non-hardening and removable with common hand tools.

D Fireproofing for penetrations of floor slabs shall also be waterproof for standing water in a non-fire condition.

E Acceptable Manufacturers:

1. Dow Corning
2. Hilti
3. Nelson
4. 3-M
5. Other manufacturers as determined acceptable by the Architect.

PART 3 - EXECUTION

3.01 SUPPORTS

A All work shall be supported from structural elements of the building, except ceiling mounted equipment such as light fixtures, detectors, remote lamps, which shall be supported from ceiling support members independent of ceiling tiles.

B Size and spacing of supports shall be determined by the load to be supported such that the working load of supports will not exceed a safety factor of 4:1.

C Spacing intervals of supports shall in no case exceed intervals required by applicable codes.

D Plastic anchors and non-removable drive-in type expansion anchors are not acceptable.

E Work under this division shall not be supported from piping, ducts, or work of other trades, unless specifically noted on the Drawings or with the written permission of the Architect.

F Drilled anchors in sides of concrete joists shall be at least 3” from bottom of joist in the vertical plane.

G Provide drilled expansion bolt anchors to support all material mounted on masonry construction.

H All hardware, nuts, bolts, channel, braces, etc., used on exterior of building shall be galvanized.

I Rod supports shall be constructed of minimum 3/8" nominal continuously threaded rod of a continuous length. Use of rod couplings to extend the length of hanger rod shall not be allowed.

J Work installed under Division 26 00 00 supported from or attached to structural steel members shall not be welded to steel member but shall be attached by clamping a device manufactured specifically for this purpose.

K Floor mounted equipment shall be anchored to supporting concrete pad with expansion anchors, minimum ½" nominal stud size.

L Framework required to support electrical equipment shall be constructed of 1 ½" x 1 ½" steel framing channel bolted together with fittings provided by the framing channel manufacturer.

3.02 PAINTING

A Provide the following painting under Division 26 00 00 "Electrical General Provisions" in accordance with the requirements of the specification section describing Finish Painting.

1. Plywood backboards – wood primer and finish coat of ASA 61 gray fire-retardant paint.
2. Exposed conduits that are a part of the life safety distribution system – primer (on conduits only) and one coat of red enamel.
3. Color of all field paint shall be as directed by Architect.

B The vendor for painting furnished under Division 26 00 00 "Electrical General Provisions" shall be Contractor's primary painting Subcontractor.

3.02 WOOD BACKBOARDS

A Unless otherwise noted on the Drawings, backboards shall be 8'-0" high by the width shown on the Drawings.

B Backboards shall be attached to supporting structure with 3/8" expansion anchors or toggle bolts with fender washers placed a maximum of 48" on center on all sides of backboard.

3.03 CONCRETE

A Provide 3000 PSI concrete where concrete work is required to support equipment furnished under Division 26 00 00, such as for equipment pads, lighting standard bases, and concrete-encased duct banks. Refer to Drawings and other sections for locations where concrete is required.

B Exposed surfaces of concrete placed under this section shall be hand rubbed and all edges shall have 1" chamfer.

3.04 EQUIPMENT PADS

A Provide 4" high concrete pads for all floor mounted electrical distribution equipment, including switchboards, and elsewhere as specifically noted on the Drawings.

B Concrete pads for switchgear, switchboard motor control centers and UPS equipment shall be level to with 1/8" from front to back and from side to side. Provide (2) embedded steel "U" channels; 4" W X 1 ½" H x 0.25" T, inverted and flush with the top of the pad. Channels shall be at the front and back of the pad located as directed by the equipment manufacturer, to provide a level base for the equipment.

C Anchor equipment in accordance with seismic study.

3.05 EQUIPMENT OF OTHER TRADES

A Motors, heaters, and other utilization apparatus shall be mounted by the trade which furnished the apparatus.

B Provide all power wiring and connections for all electrically operated equipment. Power wiring includes wiring through any line voltage control devices, such as thermostats and manual starters.

C Phase connections of motors shall provide proper motor shaft rotation.

D Starters and contactors furnished under other divisions, except those furnished as an integral part of the equipment, shall be installed under this division.

3.06 EQUIPMENT CONNECTIONS

A Connections to motors, transformers, duct heaters and other vibrating equipment shall be made with a short length of liquidtight flexible conduit, minimum 18", installed in a manner to permit movement of equipment.

B For floor-mounted equipment, which is fed overhead and not located adjacent to a wall or column, provide a rigid conduit standpipe from floor to ceiling with a floor flange. Provide appropriate cast conduit "tee" fitting in standpipe for connection of equipment.

3.07 MISCELLANEOUS WORK

A Perform all excavating, backfilling, cutting and repairing required for work included in this division.

B Protect all work from damage and from entry of concrete, moisture, and other foreign material.

3.08 FIREPROOFING

A All penetrations of fire rated walls, slabs, partitions, and ceilings shall be fireproofed with a U.L. listed system that will maintain the original fire rating of the penetrated structure.

B Initial fireproofing of sleeves, cable trays and wireways for low voltage cable shall not be installed until cables are installed or until required for issuance of certificate of final inspection, whichever is earlier.

END OF SECTION 26 05 00

SECTION 26 05 19

600 VOLT BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.01 SCOPE

A This section covers:

1. Building Wire
2. Flexible Cords

B Wires and cables used with special systems are specified with the respective system.

1.02 SIZE REFERENCE: AWG except as noted.

1.03 QUALITY ASSURANCE

A All wire and cable shall be delivered to the jobsite in original unbroken packages, cartons or reels, with the manufacturer's name, UL label, and characteristics of the product plainly visible.

B Wire or cable with defective or damaged insulation or jackets shall not be installed. Where damage, such as cuts, gouges, or slices, is discovered in the insulation or jacket while being installed, the damaged wire or cable shall be removed, and replaced. Field taping or other repair of damaged wire or cable is not acceptable.

1.04 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Provide for all wire, cable, and accessories.

C Documents shall plainly indicate the construction of the product, illustrating compliance with all requirements of Part 2, "Products".

PART 2 - PRODUCTS

2.01 BUILDING WIRE

A Conductors:

1. Material: copper, 98% conductivity.
2. Construction:

a. AWG 10 and AWG 12: solid only
b. AWG 8 and larger: stranded unless otherwise detailed on the Drawings.
c. AWG 14 and smaller: stranded (control use only).

B Insulation:

1. Type THWN/THHN, dual-rated.
2. Type XHHW: for underground secondary service entrance.
3. Type SFF: for wiring inside of luminaries.
4. Type SIS: for control wiring inside switchboards

C Voltage Rating: 600

D Color Coding:

1. Unless contrary to requirements of local codes, the following color code shall apply:

120/208 volts	480/277 volts
Phase A – black	Phase A – brown
Phase B – red	Phase B – orange
Phase C – blue	Phase C – yellow
Neutral – white	Neutral – gray
Ground – green	Ground – green

2. Isolated Ground Conductor color code: AWG 10 and smaller: green with yellow stripe in insulation. AWG 8 and larger: continuous green tape and two bands yellow tape adjacent to each other.
3. If local codes require other than these color codes to be used, the local codes shall be complied with.
4. Color code shall be indicated by:

    a. AWG #10 and smaller: insulation color
    b. AWG #8 and larger: colored tape applied at all terminations, and junction boxes, pull boxes and manholes.
    c. Ground conductors shall be color coded along entire length where visible inside boxes and equipment.

E Accepted Manufacturers:

1. Belden
2. Clifford of Vermont
3. General Cable
4. Pirelli
5. Rome
6. Senator
7. Southwire
8. Triangle
9. West-Penn

2.02 FLEXIBLE CORDS

A 300 Volt – Type SJO with copper conductors

B 600 Volt – Type SO with copper conductors

C Use only where indicated on the Drawings.

2.03 600 VOLT ACCESSORIES

A Conduit wedges: 0-Z/Gedney Type “S”

B Terminations, power connections, splices, taps:

1. Splices: Compression type, copper, insulated with heat shrink sleeves.
2. Taps #8 and larger: Compression type copper or copper alloy with snap-on insulation cover designed for the specific tap. Insulation displacement type fittings are not acceptable.
3. Taps #10 and #12: twist-on insulated spring type connectors (i.e., Buchanan B-4) or squeeze-on insulated connector (i.e., 3M #560)
4. Terminations: feeder cable to bus bar: copper or copper alloy compression lug, two bolt hole tongue if mounting space allows.
5. Terminations: feeder cable to device or other condition where compression lugs mechanically will not fit: copper alloy mechanical lug, T&B “Locktite” series.

6. Accepted Manufacturers:

a. Burndy
b. 0-Z/Gedney
c. T&B
d. Illsco
e. Square D
f. Panduit
g. Buchanan
h. 3M
i. Ideal

C Terminations: Control Conductors:

1. Compression Lug: insulated, T & B "StaKon®" or equal
2. Terminal Strip: barrier style, screw type, suitable for wire size and voltage applied.

D Wire Lubricants:

1. Lubricant used shall be certified by conductor manufacturer to be satisfactory for use with the specific conductor insulation.
2. Approved material:

a. Ideal "Yellow 77"
b. Ideal "Yellow 77 Plus"
c. 3M wire pulling lubricant

E Wire markers: Permanent, machine printed, self-laminating vinyl, T & B Type "WSC", Burndy Type "XC".

F Feeder Identification Labels: Engraved black color laminated plate attached to conductors with nylon tie, or T & B TY-553M marked with WT-163M-1 pen.

PART 3 - EXECUTION

3.01 SIZES, QUANTITIES, TYPES

A Building Wire:

1. AWG 12 minimum, except as noted below.
2. AWG 10 minimum for all outdoor applications, except as noted below.
3. 120 Volt circuits with homerun length over 100 feet shall have AWG 10 minimum homerun conductors.
4. 277 Volt circuits with homerun length over 200 feet shall have AWG 10 minimum homerun conductors.
5. Type THHN/THWN shall be used for all branch circuits, AWG 12 through AWG 8. Conductors shall be stranded, unless otherwise noted on the Drawings. Where stranded wire is to be connected to wiring devices or other equipment whose terminals are not rated for use with stranded wire, "Stakon" type terminals shall be used on the wire.
6. Conductors larger than AWG 8 installed above grade shall be Type THHN or THWN. Where installed in conduit run below grade, shall be type THWN or XHHW.
7. Where branch circuit conductors enter the wiring compartment of lighting fixtures, the insulation used on that segment of the branch circuit shall be UL listed for application at the temperature that will be encountered in the fixture.
8. General-purpose control conductors: AWG 14 minimum, stranded, protected by control circuit overcurrent protection rated not greater than or set at the rated ampacity of the conductor.

B Flexible Cords:

1. AWG 16 minimum
2. Rated for the applied voltage and load
3. Contain full size ground conductor

3.02 INSTALLATION

A Building Wire:

1. Conductors shall not be pulled in an ambient temperature lower than 15º F.
2. Adequate wire lubricants shall be used to minimize pulling tension.
3. Conductors shall not be bent, either manually or with bending tools, in a manner that puts excessive stress on insulation or causes it to buckle. Avoid bending to a radius less than manufacturers recommended minimum. Conductors with visibly damaged insulation shall be replaced at no additional cost to the Owner.
4. Conductors installed in vertical raceways shall be supported by wedge fittings attached to the conduit on intervals as prescribed by code. Provide suitable sized pull box enclosures as required to contain the support wedges.
5. All terminations of feeder conductors not made directly on device terminals shall be made with compression lugs installed in accordance with the manufacturer's instructions and with a compression tool approved for the terminator used.
6. Feeder conductors shall be individually identified at each end and at all intermediate pull boxes and other accessible locations with feeder designation, source, load, voltage, and phase.
7. General-purpose control conductors and all special systems conductors shall be identified on each end with a unique number or designation. This identification shall be recorded on the Contractor's as-built Drawings.

B Flexible Cords: Shall be installed with cord grip and strain-relief connectors.

3.03 TESTS

A Cable Test:

1. Megger test all feeders.
2. Megger test of all feeders shall be accomplished before energizing circuits. Test shall be phase to phase and phase to ground.
3. Submit a written tabulation of the results of each test to the Architect for review. Replace any cable with installed insulation resistance of less than accepted industry standards.

B Replacement of Conductors

1. Replace conductors, determined by testing as not acceptable, without additional cost to the Owner.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A Grounding System: Grounding of all electrical equipment and raceways.

B Buried Grounds: Buried ground ring, buried ground radials, driven ground rods as indicated on the Drawings.

C Miscellaneous grounding, installation of separate ground bus bars and miscellaneous bonding.

D Provide all grounding and bonding described herein and as detailed on the Drawings.

E Contractor shall provide the services of an approved Testing Contractor to perform a ground resistance test of the completed grounding system.

F The completed grounding system installation is subject to review and acceptance by the Architect.

1.02 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Required for materials and fittings for exterior grounding work.

C Documents:

1. Manufacturer’s data sheets describing each component of the system;
2. Qualifications of the proposed Testing Contractor.

PART 2 - PRODUCTS

2.01 BUILDING GROUNDING SYSTEM

A Raceways for separate ground conductors: Type RNC, Schedule 40 conduit.

B Conductors:

1. 98% conductivity copper, solid or stranded, sizes and types as indicated on the Drawings.
2. In general, main buried ground conductors shall be bare copper, AWG 3/0, seven-strand.

C Connections:

1. Underground or exterior connections shall be exothermic weld between conductors, and between conductors and ground rods.
2. In locations where conductor connects to main structural steel components, exothermic welds shall be used. For connections to light-gauge metals or in other locations where a lug must be used, a 2-hole lug shall be exothermic welded to the grounding conductor.
3. Lugs shall be 2-bolt tongue, compression type.
4. Compression Splices and Taps: Tin plated copper.
5. Water pipe clamps, fence posts, test ground rod: T&B 3900 series or Burndy Type “GAR” Series, cast bronze.
6. Exothermic welds: Cadweld, Thermaweld or Ultraweld.
7. Solid conductor to equipment or bus: Exothermic weld lug bolted to equipment.

8. Flexible copper grounding and bonding jumpers: 0-Z/Gedney Type “FB” series, or Burndy Type “B” Series, rated 190 AMPS, length as required for each application.
9. Ground Rods: “Copperweld”, copper clad steel, ¾” diameter, 10’ length. Provide sectional rods of same construction where lengths greater than 10 feet are required to be used.

D Non-Oxide Compound:

1. “NO OXID A” compound as manufactured by Sanchem Chemical Company, Chicago Illinois.

PART 3 - EXECUTION

3.01 BURIED GROUNDS

A Unless otherwise indicated, ground rods shall be driven into undisturbed earth.

B Tops of rods and all horizontal buried conductors shall be minimum 30” below finished grade.

C Minimum lateral distance from building footings shall be 24”.

D Installed grounding work below grade shall not be covered until reviewed by the Testing Contractor.

3.02 EQUIPMENT GROUNDING CONDUCTORS

A Separate Grounding Conductor: All branch circuits and feeders operating at higher than 50 volts to ground shall have an insulated equipment ground conductor, green color, sized in accordance with the National Electrical Code.

B Raceway Grounds: Other circuits shall utilize the raceway as the equipment ground conductor except where noted otherwise.

C Single grounding conductors, or RNC conduits containing single ground conductors, shall not be totally encircled by ferrous metal. Use nylon bolts in pipe hangers or in Unistrut conduit straps.

D All grounding connections shall be subject to inspection and review by the Testing Contractor and the Consultant. Provide 72 hours advance notice for scheduling review.

E Provide specified “non-oxide” compound between mating surfaces on all equipment bonding connections where mechanical connections are utilized in lieu of exothermic welds.

F Ground conductors shall be installed using long radius bends, minimum 12” radius, and shall maintain a downward or horizontal direction. U-bends or tight radius bends less than 90 degrees are not acceptable.

G All connections to the buried ground ring conductor shall be exothermic welded including connections to ground rods.

H Bond connections to equipment shall utilize exothermic weld lugs, 2-bolt tongue type, attached using machine screw thread type bolts where exothermic welds cannot, or should not, be utilized.

I Provide combination “Do Not Disconnect” and “Destination” tags at all interior bonding and grounding connections. Tags shall be green plastic laminate with white letters. Letters shall be minimum ¼” high. Attach all tags using Nylon cable Ty-raps.

3.03 GROUND TESTING

A Testing of grounding systems and made ground electrodes shall be performed by an approved testing company.

B Measurements shall include the earth resistivity and resistance of the grounding electrode system.

C Record ambient temperature; date; time; condition of soil (wet or dry). Where available, record approximate water table level (as obtained from local geologists, special core drilling is not required); type of earth materials; earth resistivity.

D Provide written record of resistance readings and all other information listed above. Include on "Record Drawings".

END OF SECTION 26 05 26

SECTION 26 05 33

CONDUIT

PART 1 - GENERAL

1.01 GENERAL

A This section describes conduit and related fittings. Other raceway types are specified in other sections.

B Boxes and other raceway accessories are specified in other sections.

C Concrete-encased duct banks are specified in Specification Section 26 05 33.

1.02 SIZE

A Minimum conduit size shall be ½"; Exception: 3/8" flexible metal conduit or Type AC or MC is permitted for flexible connections to lighting fixtures and fire alarm devices.

B Conduit size may be increased to facilitate pulling of conductors.

1.03 COORDINATION WITH WORK OF OTHER TRADES

A Coordinate the conduit layout with the work of other trades. Conduits shall be located to avoid interference with equipment that requires access, maintenance, adjustment, or repair. Conduits shall not restrict the required working clearance around such equipment.

B Conduits feeding, or connecting to, equipment provided by other trades shall not be installed until such equipment is installed or until the trade providing the equipment furnishes specific rough-in instructions.

C Conduits shall be concealed, unless otherwise indicated.

1.04 SCOPE OF CONDUIT WORK SHOWN ON THE DRAWINGS

A The conduit layout indicated on the Drawings is schematic and is not intended to show the exact location of conduits unless specifically dimensioned. Locate conduit as required by the architectural and structural details of construction and by the coordination with the work of other trades.

B Provide all fittings, offsets, supports, pull boxes and other components of the conduit system as required for a complete raceway system.

1.05 QUALITY ASSURANCE

A The conduit shall be new, of uniform quality and appearance, and marked with U.L. listing and name of manufacturer.

B All seams shall be smooth, without splits, clean, and with threads protected when delivered to or stored on site.

C Provide fittings designed and U.L. listed for use with the specific wiring method used.

1.06 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Provide Submittal Documents for the following:

1. PVC raceways and fittings
2. EMT fittings
3. Conduit bushings
4. Flexible conduit and fittings

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT (TYPE RMC)

A Manufacturers:

1. Allied Tube & Conduit Corp.
2. Jones & Laughlin
3. Pittsburgh-Standard
4. Republic
5. Triangle Wire & Cable, Inc.
6. Wheatland Tube Co.
7. Youngstown
8. ETP
9. Robroy Industries, Inc.

B Material: Full weight, steel, standard size, hot dipped galvanized outside, galvanized or coated inside, threaded ends.

C Fittings:

1. Couplings: Continuous threaded, furnished by the manufacturer with conduit. For IMC, ETP "Uni-Swivel" couplings are acceptable.
2. Threaded joint compound: Fel-Pro C5A.
3. Terminations (dry locations): Double locknuts with insulated throat, metallic grounding bushing, 0-Z/Gedney type "BLG".
4. Terminations (wet locations): Watertight hubs, 0-Z/Gedney Type "CHM", or conduit hubs integral with equipment.

2.02 INTERMEDIATE METAL CONDUIT (TYPE IMC)

A Manufacturers: same as for RMC

B Material: Lightweight steel, standard size, hot dipped or electro-galvanized zinc outside and galvanized or enamel coated inside, threaded ends.

C Fittings: same as for RMC

2.03 RIGID NON-METALLIC CONDUIT (TYPE RNC)

A Manufacturer:

1. Carlon, Division of Lamson & Sessions Co.
2. Sedco
3. Centex, Inc.
4. Heritage Plastics
5. Certainteed Corp.

B Material: PVC Schedule 40, unless otherwise indicated, rated for use with 90ºC conductors.

C Where PVC being run under slabs, or grade, turns up through the slab, or above grade, the elbow and vertical section of conduit from the elbow to the termination of the conduit shall be RMC, or IMC, as protection against the exposed conduit being damaged.

D Accessories: Fittings, couplings, cement, and other accessories shall be of the same manufacture as the PVC conduit that they are used with.

2.04 ELECTRICAL METALLIC TUBING (TYPE EMT)

A Manufacture: same as for RMC.

B Material: Thin-wall steel, galvanized outside, coated inside, threadless.

C Fittings:

1. For EMT (Sizes 1.25" and smaller):

   a. Couplings: All steel, setscrew type, concrete tight where installed in concrete, Raco, T&B, Midwest, or Steel City, O-Z/Gedney
   b. Connectors: All steel, setscrew type, with nylon throat; Raco, T&B, Midwest, or Steel City.

2. For EMT (Sizes 1.50" and larger):

   a. Couplings: All steel, setscrew type, of same manufacture.
   b. Connectors: All steel, setscrew type, of same manufacture, and insulated throat, metallic grounding bushing, 0-Z/Gedney Type "BLG".

2.05 FLEXIBLE METAL CONDUIT (TYPE FMC)

A Manufacture:

1. AFC Cable Systems, Inc.
2. Alflex
3. Electri-Flex Co.
4. Steelflex Electro Corp.

B Material: galvanized steel, Continuous single interlocking strip.

C Fittings: T&B "Tite-Bite" series, Midwest Fittings.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (TYPE LFMC)

A Manufacture: same as for FMC.

B Material: Flexible metallic conduit with PVC jacket, type "UA", with integral copper grounding conductor suitable for use as equipment grounding conductor.

C Fittings:

1. Material: Steel, or malleable iron, liquid-tight connector with insulating throat liner (use bushing above 1.25").
2. Manufacture: T&B, Midwest Fittings, O-Z/Gedney.

2.07 EXPANSION FITTINGS AND ACCESSORIES

A Expansion fittings:

1. For conduit not embedded in concrete while passing across building expansion joint, provide 0-Z/Gedney type AX for GRC and IMC or type TX for EMT. Provide bonding jumper.
2. For conduit embedded in concrete while passing across building expansion joint, provide 0-Z/Gedney type DX expansion joint or type AXDX if required by the degree of expansion possible.

B Seals for exterior wall below grade penetrations:

1. Cast-in-place type: 0-Z/Gedney Type “WSK”.
2. Cored openings: 0-Z/Gedney Type “CSMI” and Type “CSMC”.
3. Non-shrink grout where indicated on the Drawings and where acceptable to the Architect.

C Conduit bodies:

1. Used for pulling conductors: Crouse-Hinds LBD series through 2.00” and LBNEC Series 2.50” and above.
2. Used for motor connection: Crouse-Hinds condulet “T” series.

D Pull strings for empty conduits shall be equal to Greenlee 430 poly pull line.

PART 3 - EXECUTION

3.01 GENERAL

A Conduit supports and seismic bracing is specified in other sections.

B Run exposed conduits parallel or perpendicular to structural elements.

C Two or more raceways run together shall be installed on trapeze type gang hangers. Such raceways assemblies shall be run parallel or perpendicular to structural elements.

D Where bends are made in a rack of exposed conduits, field bent concentric elbows shall be used.

E All wiring shall be installed in conduit, unless plenum rated cable is specified in other sections to be installed without conduit or, unless the wiring is shown to be in a wireway or cable tray.

F Unless specifically noted on the Drawings all raceways shall be concealed in walls, floor slabs, topping slab on floor, or in ceiling plenums.

G Apply threaded joint compound on all Type RMC and Type IMC threaded joint connections.

3.02 SCHEDULE

A Unless otherwise required, provide RMC or IMC for the following applications:

1. Exposed stub-ups from floor.
2. In poured concrete walls and columns.
3. Where subject to damage.
4. Exposed on exterior of building.
5. Exterior circuits under roadways.
6. Feeder or service conduits under slab, or in grade, where concrete encased RNC PVC are not used.

B Provide EMT in dry locations only for the following applications:

1. Concealed work in slabs, walls, and ceiling plenums.
2. Branch circuit feeder wiring not otherwise required to be run in RMC or IMC.

3. Signal or communication raceways (other than underground)

C Provide RNC PVC for the following applications:

1. Concrete encased duct banks where specifically indicated.
2. Single grounding conductors as indicated and where not run-in plenum spaces.

D Flexible conduit is permitted only where concealed above suspended ceilings for connections of light fixtures, tele-power poles, and similar equipment and shall not exceed 3'-0" length. Luminary fixture whips may be 6'0" in length.

E Liquid-tight flexible metal conduit (LFMC) shall be used for all connections to vibrating equipment, such as motors and transformers, and where flexible conduit is indicated on the Drawings, except as noted above. Use Type FMC in plenum spaces.

3.03 INSTALLATION

A Conduits embedded in slabs shall have a minimum of 1" cover of concrete on all sides. Outside diameter of conduit shall not exceed 1/3 of the slab thickness and shall not be larger than 1.25".

B For physical protection during construction, include rigid galvanized steel elbows at conduit turn-ups at slab or grade. Otherwise, underground conduits maybe schedule 40 PVC.

C All threaded conduits shall be terminated with specified bushings.

D Paint all underground steel conduits with one coat of Rustoleum 5269 primer and one coat of Rustoleum 5282 acrylic industrial enamel. Touch up all wrench marks and other defects.

E Underground conduits shall be a minimum of 24" below final grade.

F Conduit joints:

1. Ream end of conduit smooth.
2. Conduit ends shall meet in coupling.
3. Provide unions where required, of the Erickson Type.
4. Provide joint compound on the male threads of RMC and IMC conduit.

G Use double locknuts at threaded conduit terminations.

H The conduit system shall be left free of all debris, water and foreign material. Plug or cap all conduits with exposed ends to prevent entrance of concrete or other foreign material. Pull a cleaning swab through all conduits prior to pulling conductors.

I Conduits run parallel to, or crossing hot pipes, shall not be closer than 0'-6" to hot pipe.

J Anchors or supports in waterproof walls shall be of the type and methodology directed by the Architect.

K Empty EMT raceways shall be terminated with connectors, and if over 1.25", specified bushings.

L Raceways in accessible ceiling plenums shall not be installed closer than 8" to ceiling.

M Groups of two or more conduits turned out of a slab shall be neatly arranged parallel to the adjacent wall and evenly spaced with at least (1) inch separation.

N Conduit passing through walls below grade shall be run through specified fittings in the wall and shall be sealed to be waterproof.

O All threaded joints in rigid conduit shall have pipe compound applied to the male thread only, to be watertight where buried below grade and not encased in concrete.

3.04 ACCESSORIES

A Pull wires: provide nylon pull wire in all empty conduits and at all data and telephone outlet locations.

B Expansion fittings: provide at all building expansion joints.

C Fire seals: provide where conduit passes through a floor slab (other than slab on grade) and where conduit passes through fire-rated masonry walls, unless cast in place.

D Install specified seals for exterior wall below grade for penetrations of conduits.

3.05 IDENTIFICATION

A All exposed conduits 2 inches and larger shall be identified with markers 20 feet on center. Also refer to Specification Section 26 05 53 Electrical Identification.

B Markers shall be permanent, plastic-sheet conduit markers extending 360 degrees around conduit.

C Marker shall identify voltage and function of conductors in conduit and be minimum length of 8 inches.

END OF SECTION 26 05 33

SECTION 26 05 34

BOXES

PART 1 - GENERAL

1.01 SCOPE

A This section covers pull boxes, outlet boxes, and junction boxes.

1.02 APPLICATIONS

A All splices, pull boxes, taps, connections, devices, etc., shall be installed using boxes of the appropriate type, designed and approved for the intended purpose.

PART 2 - PRODUCTS

2.01 GENERAL

A Box sizes specified are minimum, and shall be increased where required by code due to the number of conduit entries, conductors, devices, or taps in the box.

B All boxes shall be made of galvanized sheet steel, of code gauge thickness, but no less than 1/16" thick or 14 Gauge.

C Outlet box covers shall be attached by means of machine screws. Self-tapping sheet metal screws are not acceptable.

2.02 MANUFACTURER

A Outlet boxes: Steel City, Appleton, Raco

B Cast boxes: Crouse-Hinds, Appleton

2.03 SCHEDULE

A Schedule indicates box type; select actual box and plaster ring to suit actual conditions:

USE	BOX	COVER
Recessed device outlet	RACO 683	RACO 770
Recessed tele/data outlet	RACO 683	RACO 770
Recessed wall mounted fixture	RACO 683	RACO 767
Flush concrete outlet	RACO 272	RACO 893
Flush concrete junction	RACO 272	RACO 892
Junction box above ceiling	RACO 257	RACO 832
Exposed device outlet	C/H "FS"	C/H DS32
Exposed fixture outlet	C/H "GRFX"	---------
Flush ceiling fixture	RACO 683	RACO 767

2.04 SPECIALTIES

A Boxes installed in concrete shall be UL listed for such use.

B Through-wall boxes are not acceptable.

C Provide 3/8-fixture stud and box supported from structure when required by weight of fixture being supported.

D Junction boxes installed above ceilings shall be plenum type.

2.05 PULL BOXES AND JUNCTION BOXES

A In dry locations, boxes shall be galvanized sheet steel, minimum 12 gauge, with machine screw covers, and welded construction. Welds shall be slag-free and cold galvanized.

B In damp locations or outdoors, unless otherwise shown on the Drawings, boxes in steel raceway runs shall be galvanized cast iron, with gasketed covers and conduit hubs, or drilled and tapped. Boxes in Type RNC PVC raceway runs shall be PVC with gasketed cover.

C All boxes shall be rated for their application, such as sidewalk, or light vehicle traffic.

D Provide insulated cable support racks in feeder pull boxes where conductor length exceeds 48" inside pullbox.

PART 3 - EXECUTION

3.01 GENERAL

A Refer to other sections for mounting heights of boxes for devices and equipment.

B Boxes shall be located clear of other trades, and shall be accessible.

C Coordinate the exact location of ceiling outlet boxes and boxes concealed above ceilings, with ductwork and piping so that the boxes will be accessible.

D All required pull boxes are not indicated on the Drawings. Provided boxes as determined by actual field installation and as required for a complete installation.

E Using a permanent, waterproof, wide black marker, clearly label cover of all branch circuit junction boxes, and smaller pull boxes, with panel and circuit number of circuits contained in, or passing through, the box.

F Branch circuit and feeder junction and pull boxes used with emergency life-safety feeders and circuits shall be painted red.

G Provide engraved "lamicore" nameplate on cover of each major feeder pull, or junction, box as specified under Specification Section 26 05 53 Electrical Identification.

3.02 INSTALLATION

A Boxes shall be securely anchored in place, and shall be supported independent of the raceway system.

B Boxes installed in poured concrete shall be anchored to the formwork and protected against entry of any concrete.

C Boxes shall be set square and plumb with building elements.

D Outlets for ceiling mount fixtures shall be rigidly supported from the grid or structure with an assembly manufactured for this purpose.

E For exposed conduits, use cast boxes; otherwise, use sheet metal 4"x4" boxes.

END OF SECTION 26 05 34

SECTION 26 05 43

CONCRETE ENCASED DUCT BANKS

PART 1 - GENERAL

1.01 DESCRIPTION

A This section covers underground ductbanks.

B Concrete is specified in another section.

PART 2 - PRODUCTS

2.01 DUCT

A Duct shall be PVC pipe, U/L labeled for encased or direct burial and for use with 90° C conductors.

B Duct shall be Carlon, Schedule 40, or Sedco equivalent, unless otherwise indicated on the Drawings.

2.02 ACCESSORIES

A All couplings, cement, solvent, spacers, and other accessories shall be of the same manufacture as the duct.

B Marking tape: Panduit #HTDU-3RE for power and #HTDU-30-7 for communications.

2.03 TERMINATION

A Under equipment, at manholes, or in pits under equipment the duct bank shall be terminated with bell ends arranged to be flush with the face of the concrete.

B Where the raceways in the duct bank extend above concrete slabs or are otherwise exposed the exposed raceways shall be GRC or IMC

2.04 DUCT BANK COVER

A Concrete Encasement:

1. Ductbanks shall be concrete encased except where located beneath the building floor slab. Ductbanks extending beyond to building shall be concrete encased, beginning 5 ft. within the building perimeter.
2. All stub-ups shall be concrete encased.
3. All concrete encasement shall be 3000 PSI concrete.
4. Provide a minimum of 3” concrete cover over the ducts.
5. Provide a minimum of 2” concrete between adjacent ducts, or 7.5” on center, whichever is greater.
6. Where the ductbank extends under paved areas, provide reinforcing steel at each corner of the duct bank, extending 10 ft. beyond the edge of the pavement. Reinforcing steel shall be #4 rods.

B Gravel cover and fill:

1. Except where concrete encasement is required, the ductbank may be backfilled in lieu of encasement.

2. Backfill shall be 89 stone.

PART 3 - EXECUTION

3.01 GENERAL

A All PVC ducts shall be installed in strict accordance with the manufacturer's instructions to ensure that joints are made up securely and are watertight.

B The Architect shall be notified before pouring of the concrete encasement so that he may review the installation prior to the pour.

3.02 PROTECTION

A The ducts shall be protected from damage during installation. Any cracked or damaged pipe or joints shall be replaced before pouring concrete.

3.03 DUCT INSTALLATION

A Bends in the ducts shall be made using manufacturer-approved bending equipment, using plugs in the ends of the pipe to prevent deformation.

B Support the pipe in the ductbank using appropriate base spacers and intermediate spacers to maintain proper alignment of and separation between the ducts.

C GRC or IMC stub-ups shall be supported during installation to prevent damage to the PVC duct from the weight of the steel ell.

D Cement furnished by the duct manufacturer shall be used for all joints, in strict accordance with the manufacturer's instructions.

E Swab inside the ducts clean before pulling conductors.

3.04 LOCATION

A Top of ductbank shall be minimum 24 inches below finished grade where located outside of the building, and 8 inches minimum below finished floor slab where located beneath the slab.

B Install PVC “ELECTRICAL” or “TELEPHONE” marker tape on top of all ductbanks.

END OF SECTION 26 05 43

SECTION 26 05 48

SEISMIC RESTRAINTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section outlines requirements for seismic restraints for electrical conduit and equipment.

1.02 STANDARDS

A International Building Code (IBC)

B Refer to SMACNA/ASHRAE "Seismic Restraint Applications", First Edition, 2002.

C UL 1570 - Fluorescent Lighting Fixtures.

D ASTM E 580 - Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

1.03 SEISMIC DESIGN COMPLIANCE

A Electrical work shall meet the seismic requirements of the International Building Code with local building code amendments.

B Provide seismic bracing details for panels, miscellaneous equipment, conduits and cable trays. Analysis shall be performed by a firm or manufacturer regularly engaged in seismic analysis.

C Seismic restraint layouts and bracings shall be stamped by Contractor’s registered Structural Engineer licensed to practice in the State of Georgia.

D Building Risk Category = IV.

E Seismic Design Category = D.

F Refer to Structural Drawings and Specifications for Design Spectral Response Acceleration.

G Component Importance Factor – Life Safety Equipment: I_s= 1.5.

H Component Importance Factor – Other Equipment: I_s= 1.5.

I Loading of cable trays and ladders shall be assumed to be 90% of the maximum rated load.

J Refer to structural Drawings and structural General Notes to reference code/design information.

PART 2 - PART 2 – PRODUCTS

2.01 MATERIALS

A Hangers shall be as specified in Specification Section 26 05 00 Basic Materials and Methods.

B Obtain materials from an approved manufacturer of seismic restraint equipment.

C Lighting fixtures and supports shall conform to UL 1570 or UL 1571 as applicable.

PART 3 - PART 3 – EXECUTION

3.01 ELECTRICAL EQUIPMENT REQUIRING RESTRAINTS

A All the following equipment and raceways located inside the building shall be provided with restraints:

1. Recessed fluorescent lighting fixtures.
2. Raceways 2½" and larger which are independently supported from the structure.

B Raceways listed above are not required to be restrained if the hangers are 12" or less in length as measured from the top of the conduit to the bottom of the hanger support.

3.02 SUPPORT REQUIREMENTS

A Seismic support shall be provided for both transverse and longitudinal restraint.

B Restraints shall be as supplied by the restraint equipment manufacturer for the specific jobsite condition, installed in accordance with manufacturer's instructions.

END OF SECTION 26 05 48

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SCOPE

A Identification nameplates and labels.

B Wire and cable identification markers.

C Conduit identification markers.

1.02 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Product Data: Provide catalog data for nameplates, labels, and markers.

C Manufacturer's application conditions and limitations of use including, instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

A Engraved three-layer laminated plastic nameplate with minimum 1/4" height letters.

B Equipment connected to non-essential supply (commercial power only): Black letters on white background.

C Locations:

1. Main Service and Distribution equipment enclosures and over-current devices.
2. Electrical distribution equipment enclosures.
3. Transformers
4. Motor Control Devices and Contactors.
5. Disconnect switches.
6. Communication cabinets.

D Labels:

1. Locations required:

a. All motors.
b. All field equipment fed from 120/208 V power source.
c. All field equipment such as motors, control stations, etc.
d. All lighting switches and receptacles in unfinished areas.

E Provide engraved plastic equipment nameplates for all switchboards, panelboards, motor control centers, starters, disconnects, primary selector switches, time clock controls, contactors, and transformers.

F Nameplate wording shall be coordinated with final equipment identification nomenclature and approved by the Owners' designated representative prior to installation.

G Distribution equipment nameplates shall state equipment designation, ampere rating, voltage and phase, and “fed from (name)”.

H Nameplates for individually mounted starters, safety switches, etc., shall state load served, circuit number, voltage and phase.

I Letter Size:

1. 1/4-inch letters: Identify individual equipment, and loads.
2. 1/2-inch letters: Identify major electrical equipment and panelboards.

2.02 WIRE AND CABLE MARKERS

A Description: Non-ferrous identify tag or shrink type label.

B Locations: Each cable feeder, power circuit, and conductor in vaults, manholes, gutters, pull boxes, starters, outlet and junction boxes, control panels, panelboards, switchboards, etc., and each load connection.

C Legend: Each tag or label shall be typewritten with description listed below.

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams.

2.03 CONDUIT MARKERS

A Location: Furnish vinyl markers for each 2.00” or larger conduit longer than 6 feet for power circuits or Type MC Cable with 3/0 or larger conductors longer than 6 feet.

B Spacing: Adjacent to each termination at equipment and pull boxes and intermittently at 20 feet on center.

C Color: Match existing color-coding scheme in the facility. Where color-coding does not already exist, and then use the following color-coding on new work.

1. 208-volt system: White color and black stencil, voltage in 1/2” black letters. At the source end, also indicate the load served in 1/2” black letters. At the load end, also indicate the circuit identification in 1/2” black letters. At intermediate points, also identify both the circuit identification and load in 1/2” black letters.

2.04 UNDERGROUND WARNING TAPE

A Description: 4-inch-wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

B Location: Along length of each underground conduit or direct buried cable or duct bank.

PART 3 - EXECUTION

3.01 PREPARATION

A Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A Install nameplate and label parallel to equipment lines.

B Secure nameplate to equipment front using screws.

C Secure nameplate to inside surface of door on panelboards that are recessed in finished wall locations.

D Install conduit markers per Section 2.

E Stencil conduit markers or use adhesive letters or order pre-labeled. Handwritten entries that are neat and legible and not smeared are acceptable. Any conduit markers that that are determined not to be neat, legible, and free from smears shall be replaced to the satisfaction of the Architect.

F Identify underground conduits and direct buried cables using underground warning tape. Install one tape per trench at 3 inches below finished grade and at 12 inches above top of conduits.

G Use Scotch +35 marking tape to color-code the phase conductors equal and larger than AWG #6.

H In a high delta service, the phase with the highest voltage to ground shall be orange.

I For other conductor color-coding, see Specification Section 26 05 19 600V Building Wire and Cable.

END OF SECTION 26 05 53

SECTION 26 05 73

PROTECTIVE DEVICE COORDINATION, SHORT-CIRCUIT AND ARC FLASH STUDIES

PART 1 - GENERAL

1.01 SCOPE

A The Contractor shall furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or an approved engineering firm.

B The Contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E - Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.

C The scope of the studies shall include all electrical distribution equipment at all voltage levels.

D The Electrical Distribution System shall include everything on the premises (Owner) side of the service point (as defined by the NEC) of the serving utility. In cases of multiple service points on the premises, power generation located on premises, or separately derived systems; include these additional systems in the Electrical Distribution System and cover in the scope of the Power System Study. At the discretion of the Study Firm, separate electrical systems may be modeled using multiple electrical models; however, include all systems located at a single facility in a single Power System Study Report as specified in this section.

E Incorporate all additions and modifications to the Electrical Distribution System specified in the Contract Documents in the Power System Study and incorporate all existing equipment and portions of the Electrical Distribution System not affected by this Contract, such that the Power System Study consists of the entire Electrical Distribution System including all new and existing equipment.

F Incorporate all changes and modifications to the Contract Documents that occur over the course of the execution of this Contract in the Power System Study. These modifications include, but are not limited to, modifications resulting from Contractor requests for information, Contractor submittals, and Project change requests.

G The Power System Study shall incorporate utility power company data and equipment that affects Electrical Distribution System equipment short-circuit ratings, protective device settings, and arc flash hazards.

H The existing model of the system shall be updated. Request the latest model from the Owner to be updated. All database files and the model shall be turned over to the Owner upon Substantial Completion. The format of all database/model files shall be in the SKM format and ready for direct use in SKM Power tools for Windows latest version in use by the Owner.

1.02 REFERENCES

A IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems

B IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

C IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis

D IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings

E IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.

F IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations

G ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

H ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

I ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

J ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

K NFPA 70 – National Electrical Code, latest edition

L NFPA 70E – Standard for Electrical Safety in the Workplace

1.03 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B The short-circuit and protective device coordination studies shall be submitted to the Architect prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.04 SUBMITTALS FOR CONTRUCTION

A The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. Electronic copies of the complete report shall be provided on CD in PDF format.

B The Contractor is required to provide the study Project files, in the native format of the computer analysis software, to the Owner in electronic format.

C The report shall include the following sections:

1. Executive Summary.
2. Descriptions, purpose, basis and scope of the study
3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties
4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, fuse selection
5. Fault current calculations including a definition of terms and guide for interpretation of the computer printout
6. Details of the incident energy and flash protection boundary calculations
7. Recommendations for system improvements, where needed
8. One-line diagram

D The Contractor shall provide a hard copy of all arc flash labels.

1.05 QUALIFICATIONS

A The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of Contractor's Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B The Contractor's Registered Professional Electrical Engineer shall be a full-time employee of the equipment manufacturer or an approved engineering firm

C The Contractor's Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

1.06 COMPUTER ANALYSIS SOFTWARE

A The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program.

PART 2 - PRODUCT

2.01 STUDIES

A Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer or an approved engineering firm.

B The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D.

2.02 DATA COLLECTION

A Contractor shall furnish all data as required by the power system studies. The Contractor's Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the Contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B Source combination may include present and future motors and generators.

C Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.

D If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141-1993.

B Transformer design impedances shall be used when test impedances are not available.

C Provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated
4. Source impedance data, including electric utility system and motor fault contribution characteristics
5. Tabulations of calculated quantities
6. Results, conclusions, and recommendations.

D Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

1. Electric utility's supply termination point
2. Incoming switchgear
3. Unit substation primary and secondary terminals
4. Low voltage switchgear
5. Motor control centers
6. Standby generators and automatic transfer switches
7. Branch circuit panelboards
8. Other significant locations throughout the system.

E For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
3. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B Include on each TCC graph, a complete title and one-line diagram with legend identifying the specific portion of the system covered.

C Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
6. Conductor damage curves
7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 ARC FLASH HAZARD ANALYSIS

A The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.

B The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, disconnects, contactors, starters and busway) where work could be performed on energized parts.

C The Arc-Flash Hazard Analysis shall include all equipment in 240 volt and 208-volt systems.

D Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

E When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

F The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum number of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

G The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

H For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

I When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

J Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

K Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

2.06 REPORT SECTIONS

A Input data shall include, but not be limited to the following:

1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).
2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, kVA rating, impedance, % taps and phase shift.
3. Reactor data, including voltage rating, and impedance.
4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
5. Motor contribution data (induction motors and synchronous motors), including short-circuit reactance, rated horsepower or kVA, rated voltage, and X/R ratio.

B Short-Circuit Output Data shall include, but not be limited to the following reports:

1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

    a. Voltage
    b. Calculated fault current magnitude and angle
    c. Fault point X/R ratio
    d. Equivalent impedance

2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

    a. Voltage
    b. Calculated symmetrical fault current magnitude and angle
    c. Fault point X/R ratio
    d. Calculated asymmetrical fault currents
        (1) Based on fault point X/R ratio
        (2) Based on calculated symmetrical value multiplied by 1.6
        (3) Based on calculated symmetrical value multiplied by 2.7

    e. Equivalent impedance

3. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

    a. Voltage
    b. Calculated symmetrical fault current magnitude and angle
    c. Fault point X/R ratio
    d. No AC Decrement (NACD) Ratio
    e. Equivalent impedance
    f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
    g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis

C Recommended Protective Device Settings:

1. Phase and Ground Relays:

    a. Current transformer ratio
    b. Current setting
    c. Time setting
    d. Instantaneous setting

e. Recommendations on improved relaying systems, if applicable.

2. Circuit Breakers:

a. Adjustable pickups and time delays (long time, short time, ground)
b. Adjustable time-current characteristic
c. Adjustable instantaneous pickup
d. Recommendations on improved trip systems, if applicable.

D Incident energy and flash protection boundary calculations

1. Arcing fault magnitude
2. Protective device clearing time
3. Duration of arc
4. Arc flash boundary
5. Working distance
6. Incident energy
7. Hazard Risk Category
8. Recommendations for arc flash energy reduction

PART 3 - EXECUTION

3.01 FIELD ADJUSTMENT

A Adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C Notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH WARNING LABELS

A Provide arc flash hazard labels for each evaluated piece of equipment per referenced NEC, NFPA and ANSI standards as modified in this section.

B Provide and apply arc flash hazard labels that comply with the following:

1. Color, ultraviolet (UV)-resistant, surface-printed or thermal transfer polyester with clear polyester over laminate.
2. Suitable for outdoor use with rubber-based permanent self-adhesive designed for adhesion to textured, powder-coated, or painted metals.
3. Abrasion-, chemical-, and heat-resistant (-40°F to 230°F).
4. Manufacturer: Brady B-302, B-483 or equal.
5. Label color shall indicate danger level as follows:
   (a) 0-4 cal./cm^2 – Level 1 –orange
   (b) 4-8 cal./cm^2 – Level 2-orange
   (c) 8-25 cal./cm^2 – Level 3 – orange
   (d) 25-40 cal./cm^2 – Level 4 – orange
   (e) >40 cal./cm^2 – Level DANGEROUS- red

C Where incident energy levels indicated on labels are achieved with an alternate system configuration through the use of maintenance switches or settings changes, such as RELT, ARMS, Alternate Relay Settings Group, or other means, provide a placard below the arc flash label that clearly describes the location and operating instructions for the alternate system configuration and complies with the following:

1. Material shall be of the same type and manufacturer as the arc flash labels.
2. Minimum size 2" x 6", Minimum 18-point sans serif font.
3. White letters on red background.

D All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the Owner and after any system changes, upgrades or modifications have been incorporated in the system.

E The label shall include the following information:

1. Location designation
2. Nominal voltage
3. Flash protection boundary
4. Incident energy
5. Working distance
6. Issue date.

F Labels shall be machine printed, with no field markings.

G Labels shall be field installed by the Contractor and shall comply with the following:

1. NEC Article 110.16 and NFPA 70E.
2. Install labels in a neat and workmanlike manner.
3. Do not cover moving parts, airflow vents, cabinet exhaust, operating handles, pilot devices, signs, name plates, labels, etc. or otherwise interfere with equipment operation with label installation.
4. Provide only one label per piece of equipment. For dual-ended main-tie-main lineups two labels may be provided. Do not label each individual bucket or section.
5. Floor-standing equipment: Install label on the front of each piece of equipment.
6. Wall-mounted equipment: Install label on the front of equipment or nearby adjacent wall depending on equipment size and configuration.

3.03 ARC FLASH TRAINING

A The Contractor of the Arc Flash Hazard Analysis shall train the Owner’s qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours).

END OF SECTION 26 05 73

SECTION 26 20 00

SERVICE AND DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A Specification Sections 26 24 13 through 26 24 16 describe electrical distribution equipment such as switchboards, panelboards, motor control, transformers, and similar equipment. This section describes general requirements pertaining to the distribution system and all equipment specified in Specification Sections 26 24 13 through 26 24 16.

B Fuses, safety switches, and individually enclosed circuit breakers are specified in other Sections.

1.02 UNIFORMITY

A All switchboards, motor control centers, circuit breakers, panelboards, and other items of distribution equipment furnished under this specification shall be of the same manufacture except as otherwise noted.

1.03 STANDARDS

A All material shall be listed and labeled by Underwriters Laboratories, Inc., where such listing is available for that class of equipment.

1.04 LOCKS

A All locks for switchboards, power panels, branch circuit panels, and other distribution equipment doors shall be keyed identical.

1.05 SYSTEM CHARACTERISTICS

A The service voltage is 480/277 volts, 3–phase, 4–wire, wye, with grounded neutral.

1.06 POWER COMPANY COORDINATION AND SCHEDULING

A Field coordinate new secondary service installation and any required utility outages with the power company.

B Verify and comply with utility company requirements for installation of services of this type and install equipment furnished by the utility company for mounting by the Contractor.

C The Power Company will provide revenue metering equipment.

1.07 FAULT CURRENT

A Equipment fault current ratings (SCCR) indicated on the drawings, or specified herein, shall be the minimum rating of the equipment, including device interrupting ratings and bracing.

B UL Tested and Recognized Series-connected Combination Component Ratings are not acceptable; all equipment shall be fully rated as indicated on the drawings.

1.08 ARC FLASH HAZARD LABELS

A All switchboards, motor control centers, individually enclosed circuit breakers, panelboards, and other items of distribution equipment furnished under this specification shall be labeled with the appropriate Arc Flash Hazard Labels required by the NEC.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A Acceptable equipment manufacturers are listed within Specification Sections 26 24 13 through 26 24 16.

END OF SECTION 26 20 00

SECTION 26 20 01

DISTRIBUTION EQUIPMENT TESTING

PART 1 - GENERAL

1.01 DISTRIBUTION EQUIPMENT TESTING

A All costs incurred for testing shall be included under Division 26 00 00.

B Description of Tests:

1. Preliminary Inspections and Tests: Visual inspections of electrical equipment, wire checks of factory wiring and any other preliminary work required to prevent delays during performance of electrical acceptance tests.
2. Electrical Acceptance Tests: Those inspections and tests required to show that the workmanship, methods, inspections, and materials used in erection and installation of the electrical equipment conforms to accepted engineering practices, IEEE, ICEA and NEMA Standards, the National Electrical Code, National Electric Testing Association (NETA) specifications, and manufacturer's instructions, and to determine that the equipment involved may be energized for operational use.
3. Operating Tests: Tests performed on electrical equipment, installed under other sections, to show that the electrical equipment will perform the functions for which it was designed.
4. Final Acceptance: Final acceptance of electrical equipment will depend on equipment integrity as determined by the electrical acceptance test, and also depend on complete operational tests.

C Test and calibrate all new circuit breakers furnished under this contract and "spare" breakers scheduled to be placed into service, prior to acceptance of the building. This requirement shall apply to breakers rated 100 amp and larger.

D Tests shall be conducted by a NETA certified and approved independent testing company per NETA recommendations and in accordance with NETA Standard Practices

E In general, tests shall include the following:

1. Determine proper operation of circuit breaker trip devices.
2. Determine trip ratings or settings are correctly adjusted
3. Determine control and interlock devices perform as specified.
4. Determine electrical resistance across contact surfaces in switches, circuit breakers and busway are acceptable.
5. Torque all bolted connections
6. Determine bus bars are properly braced as specified.

F Contractor shall advise in writing as to when the distribution equipment will be tested so that the Owner's representative may be present to witness this test. At least one week's notice of this test shall be given.

G At the Contractor's option, a representative of the switchgear manufacturer may be present to witness the test and verify the results.

H These tests shall not alter the Contractor's guarantee of the equipment. All work and materials found to be in non-compliance shall be replaced and re-tested by the Contractor without additional cost to the Owner.

I Provide three (3) copies of bound test reports, bound and included in the Closeout Documentation.

END OF SECTION 26 20 01

SECTION 26 22 00

DRY-TYPE POWER TRANSFORMERS

PART 1 - GENERAL

1.01 GENERAL

A This section describes separately mounted dry-type transformers.

B Unit substation transformers and pad-mount transformers are specified in other sections.

1.02 SUBMITTAL DOCUMENTS

A Shop drawings: Indicate dimensions, taps, insulation class, K-rating, and connection diagram of windings.

1.03 OPERATION AND MAINTENANCE (O&M) DATA

A Provide record copy of final submittal documents.

B Provide manufacturers published recommended procedures for preventative maintenance and repair.

C Provide all information bound within the required Division 26 Master O&M manuals specified in another section.

PART 2 - PRODUCTS

2.01 MANUFACTURER

1. Square D
2. Eaton
3. G.E.
4. Siemens

2.02 CONSTRUCTION

A Dry-type, metal enclosed, self-cooled ventilated type, dead front, drip-proof, copper windings.

B Primary, secondary and tap connections shall be accessible from the front.

C Core and coil assembly shall be mounted to the enclosure framework on vibration isolators.

D Rated for 115º C rise, 220 º C insulation systems, and 40º C ambient.

E Two-winding type, three-phase, delta connected primary, grounded wye secondary.

F Transformer taps:

1. Three-phase, 15 kVA and smaller: (2) 2.5% above and (2) 2.5% below.
2. Three-phase, 30 kVA and larger: (2) 2.5% above and (4) 2.5% below.
3. Single-phase: (2) 2.5% below.

G Transformers with 120/208 Volt secondary shall be “K-rated” as indicated on the one-line drawing.

H Noise Level: NEMA standard for each range of kVA ratings.

I Enclosure: NEMA Type 1, except where installation location requires use of an alternate NEMA Type enclosure.

PART 3 - GENERAL

3.01 PROTECTION

A Protect from moisture and debris entry and from physical damage

B Dry out transformer windings prior energizing.

3.02 MOUNTING

A Mount and support in accordance with the manufacturer's recommendations.

B Provide seismically designed supports and bracing where required by site geographic location and where installed adjacent to essential equipment that could be damaged by potential movement during seismic events.

C Ceiling-hung transformers shall be suspended using 5/8-inch threaded rod, with a suitable size channel iron frame base for supporting the transformer. Small wall-mounted transformers shall utilize manufacturer's wall-mount brackets where wall is suitable for supporting weight of unit.

D Mount on concrete housecleaning pads on floor, or on wall, or suspended from structural elements as indicated. Anchor floor-mounted units to concrete pad.

E Provide Mason Type "W" neoprene vibration pads between base of transformer and concrete mounting surface.

3.03 CONNECTIONS

A Connections shall be made using a short length of flexible metallic conduit, between feeder conduit, and primary disconnect where provided, and enclosure. Use liquid-tight flexible metallic conduit where located in areas suitable for such use.

B Connect primary phases A, B, C to H1, H2, and H3 in that order. Connect secondary phases A, B, C to X1, X2, and X3 in that order. Color code conductors as described in other sections.

3.04 GROUNDING

A Provide a grounding electrode conductor (GEC) from the neutral terminal to the building main ground bus bar, to a main structural steel column, to a domestic potable water metallic pipe. Size per NEC, or as indicated on the drawings, and run in Type RNC conduit.

B Provide a supplemental grounding electrode conductor (GEC) in the primary feeder to the transformer sized per NEC or as indicated on the drawings.

C Transformer neutral: Bond to the enclosure and frame using a manufactured length of flexible copper wire braid with factory lugs.

END OF SECTION 26 22 00

SECTION 26 24 13

DISTRIBUTION SWITCHBOARD

PART 1 - GENERAL

1.01 DESCRIPTION

A This section describes service entrance and distribution switchboard equipment.

1.02 STANDARDS AND CERTIFICATION

A The switchboard shall be designed, assembled, and tested in accordance with the applicable standards of ANSI, IEEE, and NEMA.

B The switchboard shall be listed under UL 891.

1.03 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Physical dimensions of the equipment.

C Bussing diagrams, including bus sizes.

D Minimum device interrupting capacity.

E Bus bracing.

F Device locations and height of all circuit breaker operating handles.

G Breaker descriptions.

H Mimic bus diagram and nameplates.

I Elevation view drawings.

1.04 OPERATION AND MAINTENANCE MANUALS

A Provide two copies of operation and maintenance manuals, assembled in binders and indexed, for a complete operation and maintenance manual.

B Include maintenance instructions, detailed drawings, and parts list for circuit breakers.

C Include record copy of Submittal Documents.

D Include manufacturer’s published recommended procedures for preventative maintenance, repair, and normal operation of the switchboard, and all components.

E Included all required literature as a separate section within primary Division 26 Operation & Maintenance (O&M) Manual(s) for equipment specified in Sections 26 24 13 through 26 24 16.

1.05 TRAINNING

A Training for equipment furnished under this section shall be included.

B Training shall be scheduled at the convenience of the Owner.

C The switchboard supplier shall provide on-site training for the installed unit along with all accessory equipment for a period of 1/2 day. The training shall include operation and maintenance functions as required for the switchboard installed. Training shall be conducted separate from start-up and testing time.

1.06 PRODUCT DESCRIPTION

A Where reference is made in this Specification to a specific manufacturer, model number, or series, the equipment being specified by this reference shall be complete with, as a minimum, all standard features, accessories, ancillary device, controls, operational sequences and other characteristics shown in the manufacturer's published technical and sales data that describes the model or series referenced. Where higher standards, additional, optional features, or more stringent requirements are stated elsewhere in the Drawings or Specifications, the more stringent requirement shall be provided.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A ABB – General Electric

B Eaton

C Siemens

D Square D

2.02 CONSTRUCTION

A Freestanding, Dead-Front Switchboard, front accessible/connected. The enclosure shall not require rear or side access.

B Dimensions shall not exceed those shown on the drawings or specified. Maximum depth shall be 2'-6".

C Construction shall allow for cable entry from top and bottom into cable compartments.

D If required by field installation, provide pullbox section on top of switchboard with insulating board bottom barrier. Field-coordinate and verify exact height with building structural conditions and secondary service conductor entrance arrangement.

E The minimum short circuit interrupting and withstand rating of equipment shall be 65,000 Amps, RMS symmetrical at 480/277 volts, 3-phase, 4-wire, grounded.

F Shipping split locations shall be field coordinated with the Contractor's installing Contractor.

2.03 BUS

A All bus shall be plated copper, with joints bolted by high strength grade 5 bolts and Belleville spring type washers.

B Provide ground bus, ¼" thick, minimum 40% rated, bolted to frame full length of switchboard. Provide lugs on ground bus for incoming and outgoing feeder ground conductors. Ground bus shall be continuous throughout.

C Neutral bus shall be isolated and shall be 100 percent rated continuous entire board.

D Main Bus - full size as indicated on the drawings, entire length of switchboard. Current density shall be 1000 amps per square inch.

E Section Bus: equal to the sum of branch device frame sizes (up to size of main bus).

F Device Bus: equal to device rating as a minimum.

G Provide bus equipped for future breakers, quantity and rating as indicated on the drawings, where "provisions" or "spaces" are noted.

H All bus shall be factory drilled, or punched, with copper, two-hole tongue, compression lugs bolted to bus. Coordinate lug size requirements with feeder schedule.

I Do not splice conductors in switchboard.

2.04 MAIN BREAKER

A Molded Case Circuit Breaker (MCCB), manually operated, 100% rated to carry full load on a continuous basis when mounted in the compartmented switchboard.

B Minimum short-circuit interrupting rating, amperes RMS symmetrical, per Drawings.

C Solid State electronic trip with field interchangeable rating plug with adjustable long time pickup and delay, adjustable short time pickup and delay, adjustable instantaneous, adjustable ground fault pickup and delay, with I2T function for ground fault and short time.

D Breaker Handle: Accessible and visible without special detachable operating handles.

2.05 DISTRIBUTION BREAKERS

A Molded case circuit breakers, bolted in-place, manually operated, minimum short-circuit interrupting rating, amperes RMS symmetrical, per Drawings.

B Trip units shall be thermal-magnetic.

C Breaker Handles: Accessible and visible without special detachable operating handles.

D Space prepared with fully equipped bus provisions for future units per Drawings.

2.06 OPTIONS:

A Integral Surge Protection – 200kA/phase, 7-mode type.

1. The SPD shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.
2. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

B Integral multi-function power meter factory installed, wired and tested by switchboard manufacturer, compatible with Mod-Bus to interface with and provide power monitoring information to Digital Automatic Control System – 0.5% accuracy, to indicate RMS voltage and current, frequency, output current, output kW, kW-hours, and power factor. Output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.

PART 3 - INSTALLATION

3.01 EXECUTION

A Deliver materials and products in factory labeled packages. Store and handle per manufacturer instruction and recommendations. Protect from damage from weather, excessive temperatures and construction operations

B Install the equipment in accordance with the manufacturer's recommendations and instructions, mounted on 0"-4" high concrete housecleaning pad.

C Provide "C" shaped steel channel base leveled and installed in base concrete pad as recommended by switchboard manufacturer. Bolt the switchboard to the channel with bolts as recommended.

D Protect the equipment from moisture and contamination during shipping.

E Tighten all bus joints and connections to manufacturer's recommended torque settings prior to energizing.

F Provide a Megger test of the bussing prior to energizing. Protect switchboard electronic metering and equipment.

G Lace up all wiring using nylon ties. Secure cable bundles to insulated conductor bracing. Provide additional insulation material where required to protect cables from sharp edges inside cubicles.

H Examine substrates and other conditions where switchboard will be installed. Do not proceed until all conditions are suitable.

I Field-coordinate for correct phasing.

J Provide labor and start-up/checkout testing of the new switchboard and verify proper operation.

END OF SECTION 26 24 13

SECTION 26 24 14

POWER DISTRIBUTION PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A This section describes power distribution panelboards scheduled on the Drawings as “Power Panels”.

B Definition: As defined in the National Electrical Code.

1.02 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Provide a schedule of each panelboard demonstrating placement of branch breakers in accordance with the schedules on the Drawings. Circuit numbering shall be indicated and configured as scheduled.

C Dimensioned Drawings of panel can and panel cover detailing construction of hinged front cover trim. Gutter sizes shall be indicated.

D Provide ratings of each main and branch device, panelboard electrical characteristics, and assembly fault current rating.

1.03 OPERATION AND MAINTENCE MANUALS

A Provide record copy of Submittal Documents.

B Provide maintenance instructions, detailed Drawings, and parts lists.

C Provide manufacturers published recommended procedures for preventative maintenance, repair, and normal operation of the panelboards and all components.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A ABB – General Electric

B Eaton

C Siemens

D Square D

2.02 CONSTRUCTION

A Power distribution panelboards shall be Square D “I-Line” construction. Main lug panels shall be either top or bottom fed and shall not use plug-on lug assemblies for main lugs.

B Panelboards shall be factory assembled with plug-on breakers.

C Bus shall be plated copper.

D Construction shall be dead front with separately mounted interior trim.

E Branch breakers shall be arranged as scheduled on the Drawings.

F Multi-pole breakers shall be common trip. Tandem breakers shall not be furnished.

G Enclosure shall be galvanized sheet steel. End and side panels of enclosure shall be blank without knockouts.

H All panels shall have finished door cover trim, “hinge mounted” to enclosure box. Cover shall be factory painted.

I Provide flush lock and catch. Lock mechanism shall be metal construction.

J Gutter sizes:

1. Manufacturer’s standard, unless otherwise noted.
2. Provide additional 8” gutter width with sheet metal barrier where feeder passes through panel can or is tapped in gutter.

K Provide ground bus bonded to enclosure.

L Where a panelboard is shown to be fed by more than one conductor per phase, an individual lug shall be provided for each conductor.

M Provide circuit breaker mounting hardware where a “space” is scheduled.

N Power panels shall be designed to allow interchangeability of branch devices and shall accommodate mixing of large frame size devices.

O Minimum interrupting rating of main and all branch breakers shall be the minimum assembly rating as scheduled on the Drawings.

PART 3 - EXECUTION

3.01 GENERAL

A Branch circuit conductors shall be run into breakers at right angles to enclosure sides, bundled neatly and laced with nylon ties.

B Provide all specified engraved nameplates on all branch breakers in power distribution panelboards.

C Conductors shall not be spliced within the panelboard enclosure. Branch circuit conductors not long enough to reach the scheduled branch circuit breaker shall be replaced.

D Tighten all factory connections, including breaker mounting hardware prior to energizing panelboard.

E All unused breaker mounting spaces shall be covered or blanked.

F Lace up all conductors using nylon Ty-Raps.

3.02 MOUNTING

A Surface mount panelboards at same height to top of trim, generally 6’-6”, unless height of panel dictates otherwise.

B Power distribution panelboards shall have bottom of enclosure at minimum 0’8” A.F.F. where total enclosure height is 99” or greater. Where gypsum board walls are encountered at mounting locations, provide metal framing channel installed to transfer weight of panel to floor. Provide bracing to wall.

END OF SECTION 26 24 14

SECTION 26 24 16

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A This section describes panelboards as scheduled on the Drawings as “Panelboards” and also referred to on the Drawings and in the specification as “panel”.

B Definition: As defined in the National Electrical Code.

1.02 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Provide a schedule of each panelboard demonstrating placement of branch breakers in accordance with the schedules on the Drawings. Circuit numbering shall be indicated and configured as scheduled.

C Dimensioned Drawings of panel can and panel cover detailing construction of hinged front cover. Gutter sizes shall be indicated.

D Provide ratings of each main and branch device, panelboard electrical characteristics, and assembly fault current rating.

1.03 OPERATION AND MAINTENCE MANUALS

A Provide record copy of Submittal Documents.

B Provide maintenance instructions, detailed Drawings, and parts lists.

C Provide manufacturers published recommended procedures for preventative maintenance, repair, and normal operation of the panelboards and all components.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A ABB – General Electric

B Eaton

C Siemens

D Square D

2.02 CONSTRUCTION

A Main lug panels shall be either top or bottom fed and shall not use plug-on lug assemblies for main lugs.

B Panelboards shall be factory assembled with bolt-on breakers.

C Bus shall be plated copper.

D Construction shall be dead front with separately mounted interior trim.

E Branch breakers shall be arranged as scheduled on the Drawings.

F Multi-pole breakers shall be common trip. Tandem breakers shall not be furnished.

G Enclosure shall be galvanized sheet steel. End panelboards shall be blank without knockouts.

H All panels shall have finished door cover trim "hinge-mounted" to box on surface mounted panelboards. Factory paint cover with two coats of standard gray color enamel.

I Provide flush lock and catch. Lock mechanism shall be metal construction.

J Gutter sizes:

1. Manufacturer's standard, unless otherwise required.
2. Provide additional 8" gutter width with sheet metal barrier where feeder passes through panel can or is tapped in gutter.

K Provide ground bus bonded to enclosure.

L Where a panelboard is shown to be fed by more than one conductor per phase, an individual lug shall be provided for each conductor.

M Provide circuit breaker mounting hardware where a "space" is scheduled.

N Minimum interrupting rating of main and all breakers shall be the minimum assembly rating as scheduled on the Drawings.

PART 3 - EXECUTION

3.01 GENERAL

A For all flush mounted panelboards provide (6) six ¾" empty conduits stubbed out at top of wall from panel.

B Branch circuit conductors shall be run at right angles to enclosure sides, bundled neatly and laced with nylon Ty-Raps.

C Provide typewritten panel directories indicating location and type of load served by each branch circuit.

D Conductors shall not be spliced within the panelboard enclosure. Branch circuit conductors not long enough to reach the scheduled branch circuit breaker shall be replaced.

E Tighten all factory connections, including breaker mounting hardware prior to energizing panelboard.

F All unused breaker mounting spaces shall be covered or blanked.

G Provide specified nameplate on panel front cover.

3.02 MOUNTING

A Surface mount or flush mount, at locations as indicated on the drawings, at same height to top of trim, generally 6'-6", unless otherwise required by specific site conditions.

B Mount flush panelboards in accurately cut openings, with face of can flush with face of wall.

END OF SECTION 26 24 16

SECTION 26 27 00

MISCELLANEOUS DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A This section describes disconnect switches, separate individually-enclosed circuit breakers, and fuses for other than devices furnished with integral current-limiting fuses, such as fused circuit breakers and motor circuit protectors.

B Spare fuses of all types are included in this section.

C Provide required fuses, including spare fuses, for all fusible equipment furnished under this division.

1.02 NAMEPLATES

A Provide engraved “lamicore” nameplates for all disconnect switches, time clocks, contactors, and individually enclosed circuit breakers, indicating the equipment served. Refer also to Specification Section 26 05 53 Electrical Identification.

1.03 SPARE FUSES

A Provide (3) three spare fuses of each type and rating for all power and control fuses, including current-limiting fuses furnished as an integral part of fused circuit breakers or motor circuit protectors.

1.04 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Required for all equipment specified by this section.

C Circuit breaker submittal shall indicate device ratings, including interrupting capacity, dimensions of enclosure, and wire bending space.

1.05 OPERATION AND MAINTENCE MANUALS

A Provide record copy of all Submittal Documents and assemble as identified in another section.

PART 2 - PRODUCTS

2.01 GENERAL

A All devices shall be UL labeled.

2.02 FUSES

A Manufacturer:

1. Bussman
2. Ferraz-Shawmut
3. Little-Fuse

B Fuses applied on circuits operating at 250 Volts or less shall be 250 Volt rated.

C Fuses applied on circuits operating at 600 Volts or less shall be 600 Volt rated.

D All fuses shall have an interrupting capacity of 200,000 amps, RMS symmetrical, at rated voltage.

E Fuses for transformer feeders and motor branch circuits shall be dual-element time delay, current-limiting, Class J for 600 Amp and smaller, Class L for larger than 600 Amp.

F Fuses for feeders, control circuits, and other loads shall be fast acting, current limiting, Class J for 600 Amp and smaller, Class L. for larger than 600 Amp.

2.03 DISCONNECT SWITCH (SAFETY SWITCH)

A Manufacturer:

1. ABB – General Electric
2. Eaton
3. Siemens
4. Square D

B Shall be of the fusible or non-fusible type, as indicated on the Drawings.

C Shall be heavy duty, quick-make, quick-break, HP rated, hinged cover dual interlocked with switch handle and with external interlock defeat mechanism, with provision for handle and door padlocking.

D In dry locations shall be Type NEMA 1 enclosed.

E In damp locations, or outdoors, shall be Type NEMA-3R, enclosed, except where the applied use requires an alternate Type NEMA enclosure rating.

2.04 DOUBLE-THROW DISCONNECT SWITCH

A Manufacturer:

1. G.E.
2. Eaton
3. Siemens
4. Square D

B Shall be of the fusible or non-fusible type, as indicated on the Drawings.

C Shall be heavy duty, quick-make, quick-break, HP rated, hinged cover dual interlocked with switch handle and with external interlock defeat mechanism, with provision for handle and door padlocking.

D Switch handle shall have padlocking provisions in all (3) switch positions and external interlock defeat mechanism.

E In dry locations shall be Type NEMA 1 enclosed.

F In damp locations, or outdoors, shall be Type NEMA-3R, enclosed, except where the applied use requires an alternate Type NEMA enclosure rating.

G Provide separate ground bus. Provide insulated neutral bus where the scheduled feeder contains a neutral conductor.

H Provide lugs sized for actual feeder conductors where standard factory lugs are not suitable.

2.05 INDIVIDUALLY ENCLOSED CIRCUIT BREAKERS

A Manufacturer:

1. G.E.
2. Eaton
3. Siemens
4. Square D

B Breakers shall be of appropriate frame size for the indicated trip setting, and rated for the applied circuit voltage. Fault current interrupting rating of each breaker shall be as noted on the Drawings, minimum 42,000 A.I.C.R.

C Installed in dry locations: NEMA-1, enclosed.

D Installed in damp locations or outdoors: NEMA-3R enclosed, except where the applied use requires an alternate rating.

2.06 COMBINATION TIME SWITCH/PHOTOCONTROL

A Two-channel digital time switch with 30A SPDT contacts, capable of 20 set points, automatic Daylight Savings Time and Leap Year compensation, and LCD display.

B Unit shall have astronomic option with offset up to 4 hours and 59 minutes, before or after sunrise.

C Real time clock shall be retained by super capacitor for 100 hours.

D Unit shall be capable of manual override ON or OFF either to next scheduled event or permanently.

E Provide electronic light sensor which can be mounted up to 1000 feet from the controller.

2.07 TIME SWITCH

A Two-channel digital time switch with 30A SPDT contacts, capable of 20 set points, automatic Daylight Savings Time and Leap Year compensation, and LCD display.

B Unit shall have astronomic option with offset up to 4 hours and 59 minutes, before or after sunrise.

C Real time clock shall be retained by super capacitor for 100 hours.

D Unit shall be capable of manual override ON or OFF either to next scheduled event or permanently.

2.08 LIGHTING CONTACTORS

A Mechanically held, multi-pole, minimum of (1) one spare pole space. Contacts shall be field convertible with N.O. and N.C. indicators.

B Ratings: 30 Amp fluorescent lighting; 20 Amp tungsten lighting.

C Enclosure: Type NEMA 1, except where the applied use requires an alternate rating.

2.09 SURGE PROTECTION DEVICES

A Provide integral Surge Protection Device rated at 100kA per mode, 7-mode type.

B SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

C SPD units shall be covered by a 5-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon Substantial Completion.

PART 3 - EXECUTION

3.01 INSTALLATION

A Mount disconnects on building structural elements, or on auxiliary framing, with top at 6'-0" A.F.F. where allowed by surrounding conditions.

B Devices shall not be supported from, or mounted to, equipment of other trades unless approved in writing by the manufacturer of that equipment.

C Raceways connecting NEMA-3R enclosed devices shall be installed in such a manner as to prevent the entry of water. Raceways shall enter only the bottom of the enclosure.

D Provide engraved lamicore nameplate for each disconnect and separately enclosed breaker. Nameplates shall state source of circuit, load served, circuit number, voltage, and phase. Refer to Section 26 05 53, Electrical Identification.

E Provide disconnect switches for all motors, HVAC, plumbing equipment, and other electrically operated equipment where not connected by cord and plug, unless fed from a motor control center located in the immediate area of the motor. Disconnect switches shall be fused where equipment manufacturers electrical data label plate states "Maximum Fuse Size", or similar wording.

F Mount individual line voltage photoelectric controls on suitable weatherproof box, or suitable cast conduit fitting, in the directional orientation as recommended by the manufacturer. Adjust sensor window for suitable operation at dusk and at dawn.

G Install SPD units in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.

H Conductors from the power source to the SPD shall be routed without sharp bends and straight and short as possible. The absolute maximum conductor length shall be 3'-0".

END OF SECTION 26 27 00

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SCOPE

A This section describes wall switches, occupancy sensors, receptacles, faceplates, and other wiring devices.

B Outlet boxes are specified in another section.

1.02 STANDARDS

A All devices shall be UL labeled.

B All devices shall meet applicable NEMA wiring device standards.

C All special-purpose receptacles shall be NEMA Standard configuration.

1.03 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Submit manufacturer catalog cut sheets of wiring devices specified in this section.

1.04 OPERATION AND MAINTENANCE MANUAL

A Provide record copy of device submittal incorporated into the Project O&M Manuals.

PART 2 - PRODUCTS

2.01 MANUFACTURE

A Switches, receptacles, plates:

1. Arrow-Hart
2. Bryant
3. Hubbell
4. P&S/Legrand

B Occupancy Sensors

1. Wall Mounted: dual technology with passive infrared and ultrasonic or microphonics sensors; suitable for single or multi-gang mounting in standard depth wall box.
2. Ceiling Mounted: dual technology with passive infrared and ultrasonic or microphonics sensors, suitable for mounting at ceiling height in suitable outlet box.
3. Manufacturer: Cooper: Greengate or equivalent by The Watt Stopper, Inc. or Sensorswitch. Additional manufacturers shall be by prior approval.
4. Device types and manufacturer series numbers on the Drawings are based on Cooper: Greengate.

2.02 DESCRIPTION

A The color of all devices mounted in finished interior spaces shall be as selected by the Architect.

B Switches, receptacles:

1. Standard wall toggle switches for lighting circuits shall be heavy-duty, 277-volt, 20 Amp, AC only, nylon, quiet type, with ground bonding screw terminal, Hubbell #HBL1221 Series, back wired using screw and clamp.
2. Special purpose switches, such as 3-way, double-pole, and 4-way switches shall be similar construction.
3. Duplex receptacles shall be heavy-duty, 125-volt, 20 Amp, 3-wire grounding, nylon face, with self-grounding attachment, with ground bonding screw terminal, Hubbell #HBL5362 Series, back wired using screw and clamp.
4. Individual duplex receptacles on separate 20 Amp circuits shall be rated 20 Amp.
5. Special purpose receptacles shall be of NEMA type indicated, heavy-duty, with nylon face where available.
6. Wall toggle switches mounted adjacent to wall box dimmers shall be of the same manufacture and appearance as the wall box dimmer.
7. G.F.C.I. Type receptacles shall be rated 20 Amp, Hubbell #GF5362 Series.

C Device plates/covers for interior application:

1. Finished Room Areas: Jumbo type, material and finish as selected by Architect.
2. Utility and Mechanical Room Areas: Jumbo type, stainless steel cover.

D Device plates/covers for exterior exposed outlets:

1. Weatherproof, heavy-duty cast aluminum, "in-use" type where required by the location to be applied, Hubbell #WPxxx Series, or cast iron for FS/FD box mounting.
2. Weatherproof receptacle covers shall be suitable for the specific application.

PART 3 - EXECUTION

3.01 GENERAL

A Refer to Specification Section 26 05 34 Boxes for outlet box requirements.

B All devices shall be installed in appropriate boxes designed for the purpose, in accordance with manufacturer's directions.

C Adjacent outlets of any type, including dimmers and fan speed controls, shall be installed in multi-gang boxes with a single multi-gang faceplate.

3.02 INSTALLATION

A Locations, unless otherwise required by local codes or noted on the Drawings (dimensions in center):

1. Switches: 48 in. above finished floor, 4 in. from doorjamb on strike side of door.
2. Receptacles: 1 ft. 6 in. above finished floor, except where indicated above a countertop.
3. Telephone and data outlets: 1 ft. 6 in. above finished floor, except where indicated above a countertop.

B Grounding: Provide AWG 12, green color, insulated copper ground bonding jumpers for all switches and receptacles, bonded to the grounding screw provision within the box with separate grounding screw or lug.

C Device Labeling (applies to branch circuit devices wiring outlets under this section):

1. Provide adhesive backed label on each wall switch and receptacle device outlet coverplate indicating panelboard served from and circuit number (i.e.: LPA-6).
2. Labels shall be made on 3/8" or ½" inch stock, black color letters with clear background.
3. Label system shall be Brother "P-Touch" System or equivalent.

4. Labels shall not be applied until final touch-up painting is complete and covers are permanently mounted.

END OF SECTION 26 27 26

SECTION 26 29 00

MOTOR CONTROL

PART 1 - GENERAL

1.01 SCOPE

A This section describes motor control centers and separately mounted starters that are furnished under this division.

B Certain starters and contactors are provided under other divisions, either separately mounted or integral with the equipment, and shall be installed and connected under Division 26.

1.02 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Motor Control Shop Drawings:

1. Physical dimensions of the equipment.
2. Outline Drawings and vertical elevations showing overall and section dimensions, device locations, conduit entry space, and section weights.
3. Bussing diagrams, including bus sizes
4. Device minimum interrupting ratings
5. Bus bracing
6. Device locations, height of all breaker operating handles.
7. Circuit breaker descriptions
8. Mimic bus diagram
9. Elevation and plan view Drawings.
10. Schedule of devices, ratings, and auxiliary equipment.
11. Complete Bill of Materials

C Technical data and catalog sheets completely describing physical and electrical characteristics of all unit-mounted and individually mounted starters.

D Manufacturers published illustrative literature providing details of equipment construction and appearance.

1.03 OPERATION AND MAINTENANCE MANUALS

A Provide (3) three copies of operation and maintenance manuals, assembled in binders and indexed, for a complete operation and maintenance manual.

B Include record copy of Submittal Documents.

C Provide manufacturers published recommended procedures for preventative maintenance and repair.

D Included all required literature as a separate section within the primary Division 26 Operations & Maintenance (O&M) Manuals(s) for equipment specified in Sections 26 24 13 through 26 24 16.

1.04 COORDINATION WITH THE WORK OF OTHERS

A Coordinate with each trade furnishing equipment requiring electrical service to verify and determine that the characteristics shown on the Electrical Drawings for the circuit serving the

equipment are compatible with the requirements of the equipment being furnished. Provide written notice of any discrepancies.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A Allen-Bradley

B ABB – General Electric

C Eaton

D Siemens

E Square-D

2.02 MOTOR CONTROL CENTERS

A Motor control centers, including VFD's, shall be U/L labeled.

B SHORT CIRCUIT RATING: Motor control centers shall be rated for the short-circuit current indicated on Drawings, minimum 25,000 Amps SCCR.

C Type: Free standing, dead front, NEMA-1A enclosed, nominal height of 90", gasketed, front accessible. Each section depth shall be 20". Each section width shall be minimum 20". Rear access not required.

D Wiring: NEMA Class 1, Type B.

E Bus: Silver or tin-plated copper, bolted joints, insulated with polyester glass insulation. Incoming section shall include provisions for compression lugs on feeder cables.

F Provide disconnecting type terminals for power and control connections.

G Main bus shall be rated equal to, or exceeding, the over-current protective device serving the motor control center, 600 amperes minimum, throughout entire length of control center, and shall not be tapered.

H Provide a main lug cubicle, or compartment, to accommodate the incoming feeder. Connections shall be front accessible only. Provide a compartment for TVSS/SPD installation.

I Entire control center shall be bussed; vertical or horizontal cabling is not acceptable.

J Provide hinged covers for vertical wiring gutters, removable covers for horizontal wiring gutters, in each section for power and control conductors.

K Provide an accessible continuous ground bus, ¼" by 2", copper, bonded to each frame, with lugs for incoming and outgoing feeder ground conductors.

2.03 FEEDER and STARTER UNITS:

A Starters shall be as specified below

B Plug-in type through NEMA Size 5

C Feeder Units: circuit breaker type, with ratings as indicated on Drawings;

D Spaces: The spaces scheduled on the Drawings are the minimum number acceptable. All unused space in any vertical section shall be configured as usable space for future starters or feeder units. The initial layout shall be optimized to achieve the most compact minimum overall width, with spaces for future devices oriented to one end of the line-up in so-far-as possible.

2.04 STARTERS: Unless otherwise indicated, starters shall be:

A NEMA sized, magnetic, full-voltage, non-reversing, single-speed (FVNR);

B Where specifically indicated on the Drawings provide magnetic starters of other types, such as reversing or reduced-voltage

C Provide variable frequency AC motor drives where noted on the Drawings as "VFD" type control.

D With "hand-off-automatic" switch. Provide (2) SPDT additional contacts on switch for use by DDC Controls Vendor to monitor position of switch.

E With 120-volt control power transformer, with fused primary and grounded fused secondary

F Red and green "LED" type pilot lights to indicate "RUN" or "OFF"

G With two additional spare single-pole double-throw (SPDT) contacts.

H With electronic solid-state type overloads sized on the basis of the actual full load running current of the motors furnished; overloads in all three phases.

I With reset button in cover.

J Combination starters shall incorporate an adjustable, magnetic-only, motor circuit protector (MCP) type circuit breaker. MCP's with current limiters shall be provided where required by the available fault current. The MCP rating shall be selected on the basis of the horsepower of the actual motor installed.

K Starter doors shall be interlocked to prevent opening of the door with disconnect in the "on" position, with approved voidable feature.

L Disconnect handle shall have padlocking provisions.

M Provide combination undervoltage/anti-phase protection relay Time Mark Model 265, installed inside starter enclosure.

N Provide oversized starter enclosure where required to enable installation of the Time Mark device, specified above.

O Provide engraved plastic nameplate for each starter with description of equipment served. Refer to Section 26 05 53, Electrical Identification.

PART 3 - EXECUTION

3.01 SEPARATELY-MOUNTED INDIVIDUAL STARTERS

A Mount individual starters directly on wall, or on structure, or on auxiliary Unistrut framing where other suitable mounting surface is not available.

B For gypsum board wall mounting, group and mount starters on suitably painted, fire-retardant wood backboards.

3.02 MOTOR CONTROL CENTERS

A Install the motor control centers on nominal 4-inch-high concrete housecleaning pads.

B Provide two (2) three-inch wide “C” shaped steel channels, leveled, installed inverted and flush in concrete pad, aligned with the front and rear base of the MCC as recommended by the manufacturer. Bolt the equipment to the channel with bolts as recommended by the manufacturer.

C Install in accordance with manufacturers published instructions and recommendations.

D Leave space for termination of control wiring provided under other divisions.

E Tighten all bus joints and cable connections to manufacturers recommended torque settings prior to energizing.

F Repair all damage to factory finishes on all enclosures.

G Lace up all wiring using hi-strength nylon ties.

H Megger test bussing before energizing.

3.03 OVERLOAD ELEMENTS

A Adjust and set solid-state overload elements based on actual motor nameplate data, motor ambient temperature, and starter ambient temperature, where different from motor.

B Provide a tabulation of all motors, indicating motor designation, nameplate full-load current, ambient temperatures, and overload type provided.

3.04 FIELD COORDINATION

A Coordinate with the manufacturer’s start-up representative and assist with their field personnel as required to allow timely completion of factory required services. Place each variable frequency drive in service after all adjustments. Submit report of final settings for each control point.

END OF SECTION 26 29 00

SECTION 26 32 00

ENGINE-ALTERNATOR AND CONTROLS

PART 1 - GENERAL

1.01 GENERAL

A Furnish a standby natural gas engine-alternator, in an outdoor weatherproof enclosure, of the latest commercial type and design, with all accessories necessary for a complete installation as shown on the Plans and Drawings and as specified herein.

B The quality of the material, method of manufacture, handling, and shipping shall be such as to insure for the finished product, the properties herein specified.

C The finished unit shall comply in all respects with all applicable trade standards and all federal, state, county and municipal ordinances, rules and regulations, including compliance with noise criteria and seismic zoning. The Contractor shall be responsible for obtaining and paying for all permits and licenses for construction.

D If required, the generator vendor shall be responsible for obtaining and paying for all permits and licenses for operation, including those required by any local pollution control district or commission. The permits and licenses are to cover at least the entire period of construction and the first year of operation.

E All equipment shall be new, of current production of a national firm which manufactures/packages the engine-alternator set as a unit. The manufacturer/packager together with its authorized representative shall have full responsibility for the performance of the engine-alternator set, control equipment and its accessories.

F The terms “generator,” “generator set,” or similar terms used in this Specification refer to a packaged assembly consisting of the engine-generator set, controls, instrumentation, and all accessories, such as radiator, silencer, outdoor enclosure, charger, wiring, and piping, for a complete automatic-start, standby emergency power generator system, exclusive only of the transfer equipment, the power feeder and control wiring from the generator to the automatic transfer switch.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A The following work will be furnished and installed under other Divisions:

1. Concrete foundation for module.
2. Fuel piping for module.

1.03 RATING

A The rating of the standby engine-alternator set shall be based on the operation of the set when equipped with all operating accessories such as radiator fan, exhaust silencer, air cleaners, lubricating oil pump, jacket water pump, governor, charging generator, noise attenuation chambers, etc.

B The engine-alternator set shall have a standby rating as indicated on Drawings at 0.8 power factor, lagging, at the specified ambient temperature and altitude conditions. The output voltage shall be 277/480 volts, 4-wire, 3 phase, wye, 60 Hz. The “standby” rating is the load that can be supplied continuously during a power failure.

C Unless stated otherwise, performance criteria in this Specification are based on the standby rating.

D Provide the necessary controls and accessories to the extent that this equipment, in conjunction with the engine-alternator set, will comprise a complete operating package for installation at 1000 feet above sea level in an ambient temperature of 120 degrees F. maximum, minus 10 degrees F. minimum. Capacity ratings shall take into account all environmental factors listed above.

1.04 QUALITY ASSURANCE

A Regulatory Agency

1. The generator set shall conform to the requirements of the following codes and standards:

a. CSA C22.2, No. 14-M91 Industrial Control Equipment.
b. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
c. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
d. IEC8528 part 4, Control Systems for Generator Sets.
e. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
f. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
g. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
h. NFPA 99, Essential Electrical Systems for Health Care Facilities.
i. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

B Qualifications

1. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

C Manufacturers and Vendors

1. Manufacturer:

a. Kohler
b. Caterpillar
c. Cummins-Onan
d. Generac

2. A factory-authorized dealer shall furnish the engine-alternator.
3. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the Drawings and Specifications herein.

1.05 BASIS OF DESIGN

A The mounting details, coolant, and exhaust piping connections, and electrical connections, controls, and interlocks shown on the Drawings and described in this Specification for the engine-alternator set, and ancillary items are based upon the dimensions and installation details of one acceptable brand of each piece of equipment.

1.06 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Action Submittals:

1. Product Data

a. The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension Drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

2. Shop Drawings

C Informational Submittal:

1. Certificates

a. The generator set shall be listed to UL 2200 or submitted to an independent third-party certification process to verify compliance as installed.

2. Test and Evaluation Reports
3. Manufacturer's Instruction
4. Source Quality Control Submittals
5. Field or Site Quality Control
6. Manufacturer's Report
7. Special Procedure Submittal
8. Qualification Statement

D Closeout Submittal

1. Maintenance Contracts
2. Operation and Maintenance Data
3. Bonds
4. Warranty Documentation
5. Record Documentation
6. Software

1.07 WARRANTY

A The manufacturer/supplier shall warranty the complete engine-alternator set against defects in workmanship and material for five (5) years or 3,000 hours, whichever occurs first, from date of final acceptance. The warranty shall be comprehensive and cover all components, wiring, and performance of the generator set.

1.08 SPARE PARTS

A Provide the following spare parts:

1. 1 each type belt sealed in suitable weatherproof bag
2. 1 each type radiator hose with clamps sealed in suitable weatherproof bag
3. 1 each type plug-in control relay and timer in control cubicle
4. 3 each type air filter
5. 6 each type fuse
6. 6 each type replaceable lamp
7. 3 each type oil filter

8. 3 each type fuel filter

1.09 TRAINING

A. The engine-alternator supplier shall provide on-site training for the installed unit along with all accessory equipment for a period of 1 day. The training shall include operation and maintenance functions as required for the unit installed. Training shall be conducted separate from start-up and testing time.

1.10 STARTUP

A. The engine-alternator supplier shall provide complete startup service including technicians, load banks, cables, instruments and documentation.

A Coordinate startup of the generator set with startup of controls interface with the automatic transfer equipment.

PART 2 - PRODUCTS

2.01 ENGINE

A Engine shall have a governed speed of 1800 rpm, and shall be equipped with the following:

1. Electronic isochronous governor capable of 0.5% steady-state frequency regulation
2. 12-volt positive-engagement solenoid shift-starting motor
3. 70-ampere automatic battery charging alternator with a solid-state voltage regulation
4. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
5. Dry-type replaceable air cleaner elements for normal applications

B The engine shall be turbo charged and fueled by Natural Gas.

C The engine shall be liquid-cooled.

D The engine shall be EPA certified from the factory.

E The generator must accept rated load in one-step.

2.02 COOLING SYSTEM

A The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

2.03 AIR CLEANER

A The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

2.04 BATTERY

A Each genset requires a BCI group 31 batteries which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. Each battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 950 amps and a minimum reserve capacity of 185 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration.

The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life. Removable cell covers shall be provided to allow for checking of electrolyte specific gravity.

B Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

2.05 HOUSING

A Level 2 Sound Attenuated Enclosure

1. The generator set shall be supplied with a Sound Attenuated Enclosure, providing a maximum sound pressure of 73 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) – free field – using acoustic insulation and acoustic-lined inlet hoods, constructed from high strength, low alloy 14-gauge galvanized steel. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use external vertical air inlet and outlet hoods with 90-degree angles to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps and shall have bracing to meet 241 kph (150 mph) wind loading.
2. The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion. All enclosure parts shall receive a 100% epoxy primer electrocoat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power Armor industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
3. The enclosure must surpass a 3,000-hour salt spray corrosion test per ASTM B-1117.
4. Enclosures will be finished in the manufacturer's standard color.
5. The enclosures shall allow the generator set to operate at full load in an ambient temperature of 50°C with no additional derating of the electrical output of the generator set.
6. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.
7. Doors shall be fitted with hinges, hardware, and the doors shall be removable.
8. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
9. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
10. The complete exhaust system shall be internal to the enclosure.

B The critical silencer shall be fitted with a tailpipe and rain cap.

2.06 CONTROLLER

A Generator Set Controller

1. The generator set controller shall be a microprocessor-based control system that will provide automatic starting, system monitoring, and protection. The controller system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware, and software.

2. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.

B Codes and Standards

1. The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
2. The controller shall meet NFPA 99 and NEC requirements.
3. The controller shall be UL 508 listed.

C Applicability

1. The controller shall be a standard offering in the manufacturer's controller product line.
2. The controller shall support 12-volt and 24volt starting systems.
3. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
4. The controller shall mount on the generator.

D Controller Buttons, Display and Components

1. The generator set controller shall include the following features and functions:

   a. Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
      (1) Run Mode: When in the run mode the generator set shall start as directed by the operator.
      (2) Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.
      (3) Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.

   b. Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set from any automatic remote starting.
   c. Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
   d. Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 charters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running, the display shall scroll all-important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.
   e. Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
   f. Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
   g. Alarm Silence/Lamp Test Button. When this button is depressed, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not in AUTO mode.

h. USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
i. Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2-wire start for transfer switch and auxiliary shutdown.
j. The controller shall have auto resettable circuit protection integral on the circuit board.

E System Controller Monitoring and Status Features and Functions

1. The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:

a. Overview menu
(1) Active shutdowns and warnings shall be displayed if present and without the need of operator interface
(2) Engine runtime with total hours
(3) Average line-to-line voltage
(4) Coolant temperature
(5) Fuel level or pressure
(6) Oil pressure
(7) Battery voltage
(8) Software version
(9) Frequency
(10) Average current

b. Engine metering menu.
(1) Engine speed
(2) Oil pressure
(3) Coolant temperature
(4) Battery voltage

c. Generator metering menu.
(1) Total power in VA
(2) Total power in W
(3) Rated power % used
(4) Voltage L-L and L-N for all phases
(5) Current L1, L2, L3
(6) Frequency

d. Generator set information.
(1) Generator set model number
(2) Generator set serial number
(3) Controller set number

e. Generator set run time.
(1) Engine run time total hours
(2) Engine loaded total hours
(3) Number of engine starts
(4) Total energy in kW

f. Generator set system
(1) System voltage
(2) System frequency 50/60Hz
(3) System phase, single/three phase

(4) Power rating kW
(5) Amperage rating
(6) Power type standby/prime
(7) Measurement units, metric/English units adjustable
(8) Alarm silence, always or auto only

g. Generator set calibration; the following are adjustable at the controller.
(1) Voltage L-L and L-N all phases
(2) Current L1, L2, L3
(3) Reset all calibrations

h. Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
(1) Voltage Adjustable +/- 10%

i. Digital and Analog Inputs and outputs
(1) Displays settings and status

j. Event Log
(1) Stores event history, up to 1000 events

F Controller Engine control features and functions

1. Automatic restart - the controller has automatic restart feature that initiates the start routine and re-crank after a failed start attempt.
2. Cyclic cranking - the controller shall have programmable cyclic cranking
3. Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
4. The control system shall include time delays for engine start and cool down.
5. The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
6. The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring

G Controller Alternator control features and functions

1. Integrated hybrid voltage regulator. The system shall have integral microprocessor-based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
2. AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
3. Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
4. Power metering. The controller digitally displays power metering of kW and kVA.

H Other control features and functions

1. Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
2. Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
3. Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also

be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.

I Generator Set Warning, Shutdown Alarm and Status

1. The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:

   a. Engine functions
      (1) Critical high fuel level (alarm)
      (2) ECM communication loss (shutdown)
      (3) ECM diagnostics (alarm & shutdown)
      (4) Engine overspeed (shutdown)
      (5) Engine start aid active
      (6) Engine under speed (shutdown)
      (7) Fuel tank leak (alarm & shutdown)
      (8) High DC battery voltage (alarm)
      (9) High coolant temperature (alarm & shutdown)
      (10) High fuel level (alarm)
      (11) Low DC battery voltage (alarm)
      (12) Low coolant level (shutdown)
      (13) Low coolant temperature (alarm)
      (14) Low cranking voltage (alarm)
      (15) Low engine oil level (alarm & shutdown)
      (16) Low fuel level (alarm & shutdown)
      (17) Low fuel pressure (alarm)
      (18) Low oil pressure (alarm & shutdown)
      (19) No coolant temperature signal (shutdown)
      (20) No oil pressure signal (shutdown)
      (21) Overcrank (shutdown)
      (22) Speed sensor fault (alarm)

   b. Generator functions
      (1) AC sensing loss over & under current (alarm & shutdown)
      (2) Alternator protection (shutdown)
      (3) Ground fault input (alarm)
      (4) kW overload (shutdown)
      (5) Locked rotor (shutdown)
      (6) Over-frequency (shutdown)
      (7) Over AC voltage (shutdown)
      (8) Under-frequency (shutdown)
      (9) Under AC voltage (shutdown)
      (10) Emergency stop (shutdown)

   c. Other General functions
      (1) Battery charger fault (alarm)
      (2) Common fault (shutdown)
      (3) Common warning (alarm)
      (4) Master switch not in auto (alarm)
      (5) Generator running
      (6) Input/Output fault (alarm)

d. The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch “not in auto”, and contacts for local and remote common alarm.

J Communications

1. If the generator set engine is equipped with an ECM (engine control module), the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards

K The controller shall have the capability to communicate to a personal computer (IBM or compatible) with appropriate application software.

2.07 ALTERNATOR

A The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provisions for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

B The alternator shall have a maintenance-free bearing, designed for 40,000-hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

C The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

D Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

E Provide an alternator winding heater with thermostat to prevent condensation. Make connections to heater with suitably rated insulated conductors.

2.08 VIBRATION ISOLATION

A Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.09 GENERATOR OVERCURRENT AND FAULT PROTECTION

A The generator shall be provided with factory installed, 100% rated line electronic trip circuit breaker(s), rated per the Construction Drawings, with LSI trip functions and UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.

B Load side lugs shall be provided from the factory. The line circuit breaker(s) shall include auxiliary contacts, Load side breaker connections made at the factory shall be separated from field connections.

C When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the other generator-set alarms.

D Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

2.10 ACCESSORIES

A Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

B An air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.

C The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries, with the following features:

1. Automatic 3-stage float to equalization charge
2. Voltage regulation of 1% from no load to full load over 10% AC input line voltage variations
3. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
4. LED lamp for power ON indication
5. Current limited during engine cranking, short circuit, and reverse polarity conditions
6. Temperature compensated for ambient temperatures for -40°C to 60°C
7. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
8. UL1012 Listed
9. CSA Certified

D Block Heater - The block heater shall be thermostatically controlled, as required by the generator manufacturer, 208VAC - single phase, with isolating valves, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

PART 3 - EXECUTION

3.01 INSTALLATION

A The contractor selected for this project shall perform installation of the generator and associated equipment.

B Certain work related to installation is within the scope of work of the generator vendor where specifically required in this Specification, such as work related to testing, startup and documentation, and coordination of the work with the installing contractor.

C Generator set and accessories shall be handled only by using lifting eyes or slings as recommended by the manufacturer.

D Generator set shall be placed on a level concrete pad. Anchor isolators in place at all anchor points using either anchor bolts or drilled anchors.

E Accurately coordinate all conduit and fuel piping stub-up locations with vendor furnished shop drawings for entry into equipment.

3.02 FACTORY TESTING

A The factory test shall be performed with the generator completely assembled with silencer, radiator, and accessories.

B All engine safety features shall be tested for operation and calibrated prior to the load test.

C All control and relay functions shall be tested for proper operations.

D A high potential test of the alternator shall be performed.

E The actual radiator to be installed shall be used.

F Exhaust system shall have the actual silencer installed.

G Copies of all test sheets shall be furnished to the Owner at the completion of the test.

3.03 SITE TESTING

A Prior to acceptance of the standby AC plant installation, an entire system test shall be performed. If for any reason the 4-hour load bank test is terminated, the entire 4-hour test shall be restarted until satisfactory results are obtained.

B The engine-generator Vendor shall provide qualified personnel, load banks, test equipment, cable, etc. for this system test.

C Prior to site testing, the Vendor shall provide certification that equipment has not been exposed to adverse environmental conditions.

D Prior to the load test, all functions and safeties shall be test:

1. Verification of the proper operation of safety shutdowns.
2. Verification of all alarms (local and remote).
3. Verification of all control functions (automatic and manual).
4. Verification of proper interface and control with the Automatic Transfer Switch - ATS, including proper engine starting controls and safeties.

E Verify proper operation of all motor-controlled louvers, shutters, and ventilation fans.

F Load Test:

1. Unless otherwise noted, all load tests specified to be performed at the factory shall be repeated in the site test, including cold-start step-load test and transient tests. Provide 4-hour field load bank test.
2. Tests shall be performed as specified above for factory testing.

3.04 DUMMY LOAD BANK FOR START AND TESTING

A Outdoor, air-cooled dummy load banks shall be provided, with a generator rated capacity.

B Cables of sufficient length to reach the load bank location from the equipment to be tested.

C Load banks shall be provided by the generator set Vendor. Load banks shall be on-site for the period of time required by generator set Vendor to complete startup of the generator set.

3.05 FUEL AND CONSUMABLES

A The engine-generator Vendor shall provide all lubricating oil, coolant, lubricants and filters, and other incidental consumables required for generator set testing and for switchgear testing.

B The General Contractor shall provide fuel for testing including main tank top off, after all testing.

C After the completion of testing, all lubricating and cooling fluid levels shall be topped off.

D Oil and filters shall be changed in the event of abnormally long testing.

END OF SECTION 26 32 00

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 SCOPE

A Provide automatic transfer switches with number of poles, amperage, voltage, etc., as indicated on the Construction Drawings.

1.02 WARRANTY

A The manufacturer of the transfer device shall provide an all-inclusive, parts and labor warranty covering defects in the complete device for a period of five (5) years from the date of Substantial Completion.

1.03 STANDARDS

A The automatic transfer switches and accessories shall conform to the following standards:

1. UL 1008 – Standard for Automatic Transfer Switches
2. NFPA 70 – National Electrical Code
3. NFPA 110 – Emergency and Standby Power Systems
4. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
5. NEMA Standard ICS10-1993 – AC Automatic Transfer Switches
6. International Standards Organization ISO 9001

1.04 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Provide a minimum of three (3) copies of manufacturer's Shop Drawings including detailed enclosure dimensions, wire bending space, accessible cover locations, required clearances, bus ratings, rough-in dimensions and other data required to indicate conformance with the specification.

1.05 MANUALS

A Provide three (3) copies of operation and maintenance manuals, assembled in binders and indexed, for a complete maintenance and operation manual.

B Manuals shall include record copy of Submittal Documents, parts lists, maintenance schedules and procedures, operational procedures, and wiring diagrams.

PART 2 - PRODUCTS

2.01 RATING

A Utility and generator voltage is 120/208V, 3-phase, 4-wire, wye, with grounded neutral.

B Switch shall be a 3-pole device.

C Switch shall be rated as indicated on the Drawings.

2.02 ENCLOSURE

A Enclosure shall be NEMA 1 wall-mounted or floor-mounted enclosure, front and side accessible, with gasketed, hinged, lockable doors.

B Provide insulated neutral bus equal to full rating of switch.

C Provide ground bus able to accept conductors using 2-bolt tongue lugs.

D All metal surfaces, both inside and outside the cabinet, shall be primed and painted with ANSI 61, light gray, enamel-based paint.

2.03 TRANSFER SWITCH

A The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized from the source to which the load is to be transferred.

B The transfer switch shall be mechanically locked in each direction without depending upon gravity, gear mechanisms, latches, or hooks. Release of the locking mechanism shall be possible only by normal operation of the electrical operator.

C Main contact travel shall be smooth and continuous, with no momentary pause or delay, throughout the transfer operation. There shall be no possibility of both sources to be closed simultaneously.

D All main contacts shall be silver composition. Switches rated 400 amps and above shall have segmented, blow-on construction and be protected by separate arcing contacts.

2.04 MICROPROCESSOR CONTROLLER

A The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor.

B The controller shall be connected to the transfer switch by an interconnecting wiring harness. The interconnecting wiring harness shall include a disconnect plug to disconnect all wires including both sources of control power for routine maintenance.

C The controller shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance.

D Sensing and control logic shall be solid-state and mounted on plug-in printed circuit boards.

E Operation

1. The controller shall utilize solid-state sensing on "normal" and "emergency" for automatic, positive operation. The following shall be provided:

    a. All phases of the "normal" source and of the "emergency" source shall be monitored line-to-line with close differential voltage sensing.
    b. The "pickup voltage" shall be adjustable from 85% to 100% of nominal.
    c. The "dropout voltage" shall be adjustable from 75% to 98% of the pickup value.
    d. The starting of the engine-alternator will be initiated upon "normal" source failure.
    e. Independent frequency sensing of the "emergency" source shall be provided.
    f. The "pickup frequency" shall be adjustable from 90% to 100% of nominal.
    g. The "transfer to emergency" will be initiated when the "emergency" source voltage is 90% or more of nominal voltage, and the frequency of the "emergency" source is 95% or more of nominal.
    h. The "retransfer to normal" shall occur when "normal" source voltage restores to 90% of nominal voltage. Retransfer time delay to "normal" source shall be adjustable from

0 to 30 minutes. Set time delay to 30 minutes. The time delay shall be automatically bypassed should the "emergency" source fail and the transfer switch shall immediately retransfer to the "normal" source if the "normal" source is available.

i. A time delay to override engine start due to momentary "normal" source outages shall be adjustable from 0.5 to 6 seconds. Set time delay to 3 seconds.

j. A time delay for "shut-down" of the engine-alternator shall provide unloaded running of the engine for cool-down. The time delay shall be adjustable from 0 to 10 minutes. Set time delay to 10 minutes.

2. A clock exerciser shall be furnished to automatically start the engine-alternator at regular intervals and allow it to operate for a preset time period. A selector switch shall permit selection of "without load" or "with load" operation.

F Indicating LED type lamps, color and label as follows:

1. Green LED – Transfer switch in "Normal" position.
2. Amber LED – "Commercial Power Available" – 1 per phase.
3. Red LED – Transfer switch in "Emergency" position.
4. Amber LED's – "Emergency Power Available" – 1 per phase.
5. Source voltage for lamps shall be taken from same terminal points as voltage sensing network. Provide separate fusing for lamps in A.T.S. section.

2.05 CONDUCTOR TERMINATIONS

A Control cables: Provide barrier style screw type terminal blocks.

B Power cables: Provide copper compression type, 2-hole tongue, long barrel lugs, bolted to bus. Ground conductors shall be connected similar.

2.06 SPARE PARTS

A Provide five (5) spare indicating lamps for each automatic transfer switch.

B Provide six (6) spare fuses of each type and rating used in the automatic transfer switch.

PART 3 - EXECUTION

3.01 INSTALLATION

A Automatic transfer switches shall be installed, including all connections, where indicated on the construction Drawings and in accordance with approved Shop Drawings and manufacturer's instructions.

B Torque bus connections and tighten mechanical fasteners.

C Install floor-mounted transfer switches on a reinforced concrete pad.

D Coordinate interface with engine-alternator controls.

E Label all control wiring connections at terminations to terminal blocks and lace up conductor bundles using nylon Ty-Raps. AC and DC conductors shall be bundled separately.

F All control wiring connections inside switch shall be made with crimp type terminals on terminal blocks.

G Provide nameplate on front door of the enclosure section in accordance with Specification Section 26 05 53 "Electrical Identification".

END OF SECTION 26 36 23

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A Provide a complete lightning protection system for the building included on the contract Drawings. The system shall provide safety for the building, the buildings contents and occupants by preventing damage caused by lightning. The design of this system is to be in strict accordance with this section of the specifications.

B The lightning protection system shall be installed by a firm actively engaged in the installation of Master Labeled Lightning Protection Systems and shall be so listed by Underwriters Laboratories Inc. The completed system shall comply with the latest editions of the Installation Requirements for Lightning Protection Systems, UL96A and of the National Fire Protection Association's Lightning Protection Standard, NFPA 780.

C The work covered under this section of the specification consists of furnishing labor, materials and services required for the completion of a functional and unobtrusive lightning protection system approved by the Architect and Underwriters Laboratories Inc.

D The base bid scope of work shall include all necessary installation and components, including but not limited to; ground rods, conductors, bonding and splicing equipment, lightning protection conductors, standing seam bases for mounting air terminals onto metal standing seam, air terminal bases, air terminals and all other components necessary for a complete system. The bidder shall review the Architectural Drawings to assess the conditions of the building and coordinate work required for installation of a complete system. The Owner will not pay for change orders relating to additional labor and components after award of contract.

1.02 REFERENCES

A The completed lightning protection system shall comply with the latest issue of the following standards and form a part of this specification.

1. Manufacturer's published specifications, product data sheets, application instructions, and technical bulletins.
2. 29 CFR 1910 and 29 CFR 1926 – OSHA Regulations.
3. NFPA 780, Standard for the Installation of Lightning Protection Systems.
4. UL 96A, Installation Requirements for Lightning Protection Systems.
5. UL 96A – Standard for Safety for Installation Requirements for Lightning Protection Systems.

1.03 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Shop Drawings shall be submitted to the Architect for approval prior to commencement of the installation. Shop Drawings are to show the extent of the system layout designed specifically for the building included in the Contract Drawings along with details of the products to be used in the installation. Submit product data sheets showing application, dimensions, and material of each component utilized in the lightning protection system. Submit letter of findings at completion of work.

1.04 QUALITY ASSURANCE

A Pre-Installation Conference: Convene a pre-installation conference with all applicable trades and disciplines one week prior to commencing work of this section.

B The Contractor shall furnish a UL Master Label Certificate Letter of Findings, certifying that the work meets the UL 96A standard, upon completion of the installation.

C Coordinate work under this section with roofing Contractor.

PART 2 - PRODUCTS

1.05 STANDARD

A All materials used in the installation shall be new and shall comply in weight, size and composition as required by UL 96A and NFPA 780 and shall be labeled or listed by Underwriters Laboratories Inc. for use in lightning protection systems. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection equipment. The manufacturer shall be listed by UL as a recognized manufacturer of lightning protection components.

1.06 ACCEPTABLE MANUFACTURERS

A East Coast Lightning Equipment, Inc.

B ERICO, Inc.

C Harger, Inc.

D Heary Brothers Lightning Protection Co., Inc.

E Independent Protection Company, Inc.

F Preferred Lightning Protection

G Robbins Lightning, Inc.

H Thompson Lightning Protection, Inc.

1.07 MATERIALS

A Class I materials shall be used on structures that do not exceed 75 feet in height and Class II materials shall be used on structures that are 75 feet or higher above average grade.

B Copper materials shall not be mounted on aluminum surfaces including Galvalume, galvanized steel and zinc; this includes these materials that have been painted.

C Aluminum materials shall not come into contact with earth or where rapid deterioration is possible. Aluminum materials shall not come into contact with copper surfaces.

1.08 AIR TERMINALS

A Air terminals shall project a minimum of ten inches above the object or area it is to protect and shall be located at intervals not exceeding 20’-0” (preferably at centerline of columns) along ridges and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12). Flat or gently sloping roofs exceeding 50’-0” in width shall be protected with additional air terminals located at intervals not exceeding 50’. Air terminals shall be located within two feet of roof edges and outside corners of protected areas.

B Air terminals shall be installed on stacks, flues, mechanical units and other metallic objects not located within a zone of protection and which have an exposed metal thickness less than 3/16 of

an inch. Objects having an exposed metal thickness 3/16 of an inch or greater shall be connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

C Air terminal bases shall be securely fastened to the structure in accordance the specified standards including the use of adhesive that is compatible with the surface it is to be used on or stainless-steel fasteners. Air terminals located on standing seam metal roof shall be mounted with a standing seam base to the rib of the standing seam roof.

D Main conductors shall be sized in accordance with the specified standards for Class I or Class II structures and shall provide a two-way horizontal or downward path from each air terminal to connections with the ground system. Conductors shall be free of excessive splices and no bend of a conductor shall form a final included angle of less than neither 90 degrees nor have a radius of bend less than 8 inches.

E Down conductors shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors. Where down conductors are installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards shall be used to protect the conductor a minimum of 6 feet above grade. Metallic guards shall be bonded at each end.

F In case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals not exceeding 100 feet along the perimeter of the structure.

1.09 ROOF PENETRATIONS

A Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars and appropriate roof flashing. Conductors shall not pass directly through the roof. Contractor shall ensure that the Roofing Subcontractor shall furnish and install the materials required to properly seal all roof penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components.

1.10 GROUND TERMINATIONS

A Ground electrodes shall be copper clad steel and a minimum 5/8” diameter and 10 feet long. A ground electrode shall be provided for each down conductor. The down conductor shall be connected to the ground electrode using a bronze ground rod clamp having a minimum of 1 ½” contact between the ground electrode and the conductor measured parallel to the axis of the ground electrode, or by an Ultraweld exothermically welded connection. Ground electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

B Where the structural steel framework is utilized as the down conductor for the system, ground terminals shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart. Columns shall be grounded using either bonding plates having 8 square inches of surface contact area or by Ultraweld exothermically welded connections.

C All ground electrodes shall be interconnected with a ground loop conductor on structures that exceed 60 feet in height. The ground loop conductor shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor.

1.11 EQUIPOTENTIAL GROUNDING

A Common interconnection of all grounded systems within the building shall be ensured by interconnecting to the lightning protection system using main size conductor and fittings.

B This interconnection shall include but is not limited to the electrical service, telephone and antenna system grounds as well as all underground metallic piping systems including water, gas and sewer. Interconnection to a gas or water line shall be made on the customer's side of the meter.

C Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in the latest edition of NFPA-780 Standard for the Installation of Lightning Protection Systems shall be bonded to the lightning protection system using the required bonding conductors and connections.

1.12 SURGE PROTECTION

A Surge suppression shall be provided at all power service entrances and at entrances of conductive signal, data and communication services.

PART 3 - EXECUTION

3.01 INSTALLATION

A The installation shall be installed by an UL listed lightning protection installation company.

B All air terminals located on standing seam metal roof shall be mounted on the rib of the standing seam roof and shall not be permitted to be installed on the pan of the roof panel of the standing seam roof.

3.02 COORDINATION

A Coordinate the installation of the lightning protection system with other trades

B Coordinate all roof penetrations, fasteners and adhesive with the roofing Contractor prior to installing any materials on the roof.

C Verify that surfaces are ready to receive work.

D Verify that all systems that may influence the lightning protection system design are included or referenced on the Shop Drawings.

E Verify required procedures comply with terms of roofing warranty to prevent voiding of roofing warranty.

3.03 INSPECTION AND CERTIFICATION

A New Structures:

1. Upon completion of the installation of the lightning protection system the Contractor shall furnish the UL Master Label Certificate Letter of Findings, certifying that the work meets the UL 96A standard, issued by Underwriters Laboratories Inc.

END OF SECTION 26 41 13

SECTION 26 50 00

LUMINAIRES

PART 1 - GENERAL

1.01 SCOPE

A. Interior lighting fixtures, lamps, ballasts, and drivers.

B. Emergency lighting units.

C. Exit signs.

D. Lighting fixture supports.

E. Retrofit kits for fluorescent lighting fixtures.

1.02 STANDARDS

A. ANSI/NFPA 70, National Electrical Code

B. IESNA LM-79, Electrical and Photometric Measurement of Solid-State Lighting Products

C. IESNA LM-80, Approved Method of Measuring Lumen Maintenance of LED Light Sources

D. IESNA TM-21, Luminaire Classification System for Indoor Luminaires

E. UL1598, Standard for Safety of Luminaires

F. All material shall bear the label of the Underwriters Laboratories, Inc.

1.03 VOLTAGE

A. Fixture voltage is indicated by circuit in which it is connected. Contractor shall determine fixture voltage from Drawings.

1.04 CEILING INTERFACE

A. Specific catalog numbers shown for fixtures do not necessarily describe all mounting hardware or accessories required for a particular installation. Determine ceiling types from the finish schedule specified under another division, and furnish all required materials for a complete and proper installation. Provide plaster frames for wet plaster or stucco ceilings.

1.05 COORDINATION

A. Provide other trades with a schedule of the outside dimensions of each type of recessed fixture when Submittal Documents have been approved. Examine applicable plans and shop Drawings describing the work of other trades for possible conflicts in the clearances required for installation. The Architect shall be notified prior to fabrication of any material of any conflict that cannot be resolved at no cost to the Owner by normal jobsite coordination between trades.

1.06 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Furnish a bill of material cover sheet and original data sheet, combined into binder, describing each fixture type. If a catalog page describes more than one fixture, the page shall be appropriately

marked identifying the exact item being submitted. Photometric data shall be submitted for each fixture type that has a reflector or lens for directing the light output. Drawings larger than 8 ½ x 14 shall be submitted in 8 ½ x 11 envelopes bound into the submittal brochure.

C. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Copy of Solid-State Ballast warranty.

E. Copy of driver warranty.

F. Point by point plot on a scaled drawing to indicate the foot-candle performance of all exterior fixtures.

G. A tabulation of all lamps to be utilized in each fixture.

H. Where equivalent manufacturers for lighting fixtures are not indicated or scheduled, one manufacturer and model number is listed as "Design Standard" on the fixture schedule. The intent is to define the appearance, style, function, performance, and level of quality deemed necessary by the Architect as well as to define the standard used by the Architect as the basis of the design described by the Drawings and specifications. Light fixtures equal in the appearance, style, function, performance, and level of quality as manufactured by other than the "Design Standard" manufacturer may be proposed by the Contractor in accordance with specification section 01 63 00. The proposed material will be evaluated by the Architect and determination of equality with the "Design Standard" will not be unreasonably withheld. To assist in this determination, the Contractor shall submit detailed photometric and power density calculations for each space that the proposed alternate fixture will be utilized. If the alternate manufacturer or model is determined by the Architect to not be equal to the "Design Standard" in a parameter whose acceptance would not be in the best interest of the Owner, the alternate fixture will be rejected. The Contractor may then submit, at no additional cost to the Owner, another alternate fixture or the fixture scheduled as the "Design Standard" for review by the Architect. Alternate material furnished shall comply with all requirements of the material specification, shall be, as determined by the Architect, equal in form and performance to the "Design Standard" and shall be dimensionally identical to the design standard where features are visible or where the work of other trades is affected. Determination of equality shall remain solely with the Architect and his decision shall be final.

1.07 OPERATING and MAINTENANCE MANUAL

A. Provide record copy of Submittal Documents.

B. Provide tabulation of lamp type furnished for each fixture type.

C. Bind all information together with other Division 26 manuals.

1.08 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Luminaires shall be fully assembled and individually electrically tested prior to shipment.

D. Manufacturers of LED luminaires shall demonstrate a suitable testing program to ensure system reliability and to substantiate lifetime claims.

E. The sole use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.

F. Luminaires shall be provided with a minimum 5-year warranty covering, LEDs, drivers and paint finish.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. All lamps of any one type shall be of the same manufacturer.

I. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least [0.125 inch (3.175 mm)] minimum unless otherwise indicated.
    b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

2.02 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
4. Sound Rating: Class “A”
5. Total Harmonic Distortion Rating: Less than 10 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Power Factor: 0.95 or higher.
8. UL, CBM, & ETL listed.
9. Suitable for continuous operation in fixtures where used.
10. Warranty by ballast manufacturer to fixture end user: minimum 2 years non-prorated.

11. Ballast shall have an RFI filter on line input and shall comply with FCC Part 18 and NEMA requirements limiting EMI and RFI and shall not interfere with the operation of other normal electrical equipment.
12. Design standard: Triad Ballastar.
13. Acceptable manufacturers: Advance, Valmont, Osram/Sylvania, General Electric/Motorola.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

D. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

2.03 BALLAST FOR COMPACT FLUORESCENT LAMPS

A. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 10 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.95or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for non-consumer equipment.

2.04 BALLAST FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
3. Rated Ambient Operating Temperature: 104 deg F (40 deg C).
4. Open-circuit operation that will not reduce average life.
5. Open-circuit operation that will not reduce average life
6. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.
7. UL listed.
8. Type as noted by fixture type.
9. Rated to operate at voltages within ±10% of nominal.
10. Provide with individual fuse for each ungrounded input conductor. Fuse size as recommended by ballast manufacturer.

2.05 DRIVERS FOR LED FIXTURES

A. Electronic Driver for LED Fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations. Include the following features unless otherwise indicated:

1. Rated for 50,000 hours of life, unless otherwise noted.
2. Sound Rating: Class A.
3. Total Harmonic Distortion Rating: 15 percent or less.
4. Current Crest Factor: 1.5 or less.
5. 0-10V Dimming Standard (Step Dimming does not qualify).

2.06 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type – unless noted otherwise.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

2.07 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type – unless noted otherwise.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

2.08 EMERGENCY BATTERY BALLAST

A. Emergency lighting shall be provided by using a standard fluorescent fixture equipped with emergency ballast. This emergency ballast shall consist of a field-replaceable, high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one metal case with a 2’ length of flexible conduit.

B. A solid-state charging indicator light to monitor the charger and battery, single-pole test switch and installation hardware shall be provided.

C. The emergency ballast shall be capable of operating all fluorescent lamps within the fixture at the minimum lumens initial output listed below for a minimum of 90 minutes:

1. 1 Linear fluorescent lamp a minimum of 2250 to 3000 lumens.
2. 2 Linear fluorescent lamps a minimum of 1375 to 1500 lumens per lamp.
3. 3 Linear fluorescent lamps a minimum of 1083 to 1133 lumens per lamp.
4. 1 Compact fluorescent lamp a minimum of 350 to 750 lumens.
5. 2 Compact fluorescent lamps a minimum of 212 lumens to 375 lumens per lamp.

D. The emergency ballast shall be suitable for indoor locations.

E. The emergency ballast shall have 8 Watts maximum of input power and a 57.6 Watt-hour battery capacity and shall exceed emergency standards set forth by the current NEC.

F. The emergency ballast shall be U.L. listed for installation on top of or remote from the fixture and shall be warranted for a full five years from date of purchase.

2.09 FLUORESCENT LAMPS

A. Linear Fluorescent Lamps:

1. T8 rapid-start lamps as scheduled, CRI 80 (minimum), color temperature 3500° K and average rated life 20,000 hours unless otherwise indicated.
2. T5 rapid-start lamps as scheduled, CRI 80 (minimum), color temperature 3500° K and average rated life 20,000 hours unless otherwise indicated.
3. Install clear lamp protection sleeves on linear T8 fluorescent lamps mounted in turret type industrial fixtures.
4. Acceptable manufacturers: GE, Osram/Sylvania, Philips.

B. Compact Fluorescent Lamps:

1. 4-Pin, CRI 80 (minimum), color temperature 3500°K, average rated life of 10,000 hours at three hours operation per start, and suitable for use with dimming ballasts – unless otherwise indicated.
2. Acceptable manufacturers: GE, Osram/Sylvania, Philips

2.10 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.

B. Metal-Halide Lamps: ANSI C78.43, with minimum CRI 65, and color temperature 4000° K – unless noted otherwise.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K – unless noted otherwise.

D. Acceptable manufacturers: GE, Osram/Sylvania, Philips.

2.11 LED FIXTURES

A. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Include the following features unless otherwise indicated:

1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
2. Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a minimum ambient temperature of (25°C).
3. Light Emitting Diodes tested under LM-80 Standards for a minimum of 12,000 hours.
4. Color Rendering Index (CRI) of 82 at a minimum.
5. Color temperature 3500°K, unless otherwise indicated.
6. Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.
7. Fixture efficacy of 60 Lumens/Watt, minimum.
8. 5-year luminaire warranty, minimum.
9. Photometry must comply with IESNA LM-79.
10. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.

C. Technical Requirements

1. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.
2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.
4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 15 percent.
5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

D. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
4. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.

2.12 TROFFERS

A. Housing

1. All steel parts shall be painted after fabrication with a minimum 90% reflective paint.
2. The housing for a fixture with parabolic louvers shall be a minimum of 5½" deep.
3. The housing for a fixture with lens shall be a minimum of 4½" deep.
4. 3-lamp fixtures with 18-cell parabolic louver shall have two ballast covers for use with multi-level switch control of the inner lamps separate from the outer lamps.

B. Parabolic Louvers

1. The finish shall be silver, semi-specular, and low-iridescent.
2. The louver shall be a minimum 3" deep.
3. The louver shall be hinged and secured to the housing with reversible cam-action latches.

C. Lens

1. The lens shall be a minimum of 1/8" thick, and shall be pattern A-12.
2. The lens frame shall be regressed aluminum, hinged and secured to the housing with reversible cam-action latches.
3. Submit a 4" x 4" sample of lens with submittals.

2.13 RECESSED DOWN LIGHTS

A. Reflector cones shall be one-piece, self-flanged.

2.14 POLES, POLE MOUNTED FIXTURES, BOLLARDS, WALL MOUNTED AREA LIGHTS

A. Fixture and Bollard Finish

1. Powder coating, 5mil minimum thickness
2. Color as selected by Architect

B. Area Lighting Poles:

1. Aluminum square non-tapered pole with finish as scheduled.
2. Constructed of seamless 6063 alloy aluminum tubing with internal vibration damper.
3. With galvanized anchor bolts and hardware.
4. With handhole at base and ground lug accessible through handhole.
5. With anchor bolt cover with finish on all surfaces identical to pole finish.
6. Wind rating: 100 MPH when supporting scheduled fixtures.

C. Provide in-line, waterproof disconnecting fuse holders at each pole at handhole with fuses sized at 300% of ballast line amps.

2.15 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

C. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

E. Fixtures suspended with aircraft cable

1. The fixture manufacturer shall provide the field adjustable, 1/16", galvanized, steel aircraft cable.
2. Provide cable length as required to mount the fixture at the height shown on the Drawings measured to the top of the fixture.
3. In areas with finished ceiling, the aircraft cable shall be supported with a ¼ - 20 threaded rod anchored in/to the structure and extended ¾" below the finished ceiling.
4. The fixtures shall be supported at a maximum of 8'-0" centers.

2.16 RETROFIT KITS FOR FLUORESCENT LIGHTING FIXTURES

A. Ballast and Lamp Change Kit: UL 1598, Type II. Suitable for changing existing ballast, lamps, and sockets.

2.17 FIXTURE TYPES:

A. As scheduled on the Drawings.

B. All downlights shall be by the same manufacturer.

C. All parabolic fluorescent troffers shall be by the same manufacturer.

D. All direct/indirect and indirect suspended fixtures shall be by the same manufacturer.

PART 3 - EXECUTION

3.01 LOCATION

A. The exact location of all fixtures in finished areas shall be as shown on the reflected ceiling plans. If the location shown on the reflected ceiling plan for a fixture differs from the location shown on the electrical plans, the fixture shall be installed as shown on the reflected ceiling plan. In utility and mechanical rooms, the Contractor shall adjust the location and mounting height of the indicated fixtures for best coordination with the work of other trades.

3.02 INSTALLATION

A. Lighting fixtures shall be set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end

D. Fluorescent fixtures with steel housings shall not be installed in direct contact with concrete structure, but shall be held off of the structure at least ½ inch with approved spacers.

E. All wire run into a fluorescent or HID fixture housing or raceway shall be minimum 90ºC rated, Type THHN/THWN. Wiring run into incandescent fixture housings shall be 150ºC rated, Type SFF, or better.

F. Flexible conduit connections to recessed fixtures shall be six (6) ft. lengths of 3/8-inch steel flex with flex connectors as specified in the “Basic Materials and Methods” section. The flexible connections shall contain stranded conductors, AWG #14 minimum, Type THWN, with a separate grounding conductor bonded securely to the fixture housing.

G. Flexible conduit connections to recessed fixtures located in accessible ceilings shall be installed such that each fixture can be relocated one (1) ceiling tile space in any direction.

3.03 SUPPORTS AND ANCHORS

A. Fixtures shall not be supported from ducts or piping of other trades without the approval of the Architect.

B. Recessed fixtures not designed to lay-in a ceiling grid, and suspended fixtures, shall be supported by a threaded rod dropped from approved channels or brackets transmitting the fixture weight to the building structure. If the fixture is outlet box mounted, the box shall be supported in the same manner.

C. Provide four (4) clips with each lay-in type fixture anchoring the fixture to its supporting grid members.

D. Hardware and unpainted metal used for mounting of exterior fixtures shall electrogalvanized.

3.04 ACCEPTANCE

A. Incandescent fixtures used for construction lighting shall be provided with new lamps prior to final acceptance.

B. Adjust locations of fixtures shown in mechanical equipment rooms to best suit the actual conditions based on final placement of equipment of other trades. Install in a manner and location to obtain optimum illumination.

C. Target and focus adjustable fixtures in the presence of the Architect's Electrical Engineer.

D. Noisy ballasts shall be considered defective and shall be replaced.

E. All fixtures' trims shall be free of light leaks as viewed from the occupied space. Suitably seal around trims to eliminate any light leakage around downlight trims and fluorescent fixtures. Louvers and lens shall be clean and free from fingerprints, dust, and physical damage.

F. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION 26 50 00

SECTION 27 0500 – TECHNOLOGY SYSTEMS – GENERAL CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and related sections as if they were a part of this section.

B. Applicable Publications, Codes, & Standards: Whenever Contract Documents reference published specifications, codes, standards, or other requirements, it shall be understood that where no date is specified, only the latest specification, code, or standard shall apply; except to the extent that said publications may be in conflict with applicable laws, ordinances, or adopted codes.

C. All work and materials specified shall conform to or exceed the requirements of the latest adopted standards and code requirements (including adopted addenda and / or modifications) from the following agencies:

1. Underwriters Laboratories (U.L.)
2. International Conference of Building Officials (ICBO)
3. National Electrical Manufacturers Association (N.E.M.A.)
4. Institute of Electrical and Electronic Engineers (I.E.E.E.)
5. Telecommunications Industry Association / Electronic Industries Association (TIA / EIA)
6. Building Industry Consulting Service International (BISCI)
7. International Association of Conference Centers (IACC)
8. American National Standards Institute (A.N.S.I.)
9. National Fire Protection Association (N.F.P.A.)
10. The National Electrical Code (NEC / N.F.P.A. 70)
11. National Fire Code (N.F.P.A. 72A)
12. Life Safety Code (N.F.P.A. 101)
13. American’s With Disabilities Act (A.D.A.)

D. Systems Integration: Technology Systems installation requires full integration and coordination between works described across multiple sections of these specifications. Requirements of the following sections are complementary, contain interrelated requirements, and require full coordination and integration.

1. Communications Equipment Room Fittings (27 1100)
2. Communications Copper Cabling (27 1513)
3. Communications Optical Fiber Cabling (27 1523)
4. *Communications Coaxial Cabling (27 1533)*
5. Audio / Video Systems (27 4100)
6. Access Control / Duress / Intrusion Detection / Door Monitoring System (28 1310)
7. Intrusion Detection System (28 1320)

8. Visual Surveillance System (VSS-CCTV) (28 2300)

E. Special Integration: Technology Systems installation requires special integration and coordination between works described in the list below. Requirements for Technology Systems may be found in the Contract Documents from the following:

1. Division 1 – General Requirements
2. Division 2 – Existing Conditions
3. Division 8 - Openings
4. Division 23 – Heating Ventilating & Air Conditioning
5. Division 25 – Integrated Automation
6. Division 26 – Electrical
7. Division 27 – Communications
8. Division 28 – Electronic Safety & Security

1.2 SUMMARY

A. This section, Technology Systems – General Conditions, defines general requirements for Technology Systems detailed in the sections identified in Part 1.1.D above, in the drawings, and as detailed elsewhere in the Contract Documents. It is the intent for the Contractor to provide all labor, materials, equipment, installation, delivery services, testing, commissioning, and supervision required to install and deliver to the Owner fully functional Technology Systems as specified.

B. Qualifications: The Technology Systems installation firm must exhibit competence and experience in the field of Low Voltage Systems Integration. This competence must be exhibited as a part of the proposal tender package and should contain the following:

1. Listing of experience on satisfactorily completed projects of similar size, scope, and technical difficulty within the past three years.
2. Municipal issued Low Voltage Contracting Licenses as required by local building and zoning regulations / AHJ. Installer must meet all requirements of the AHJ.
3. Listing of all technical staff to be assigned to this project and all industry certifications they hold (NICET, RCDD, CET, etc.)
4. Statement of product dealerships for the majority of equipment being provided. Statement to include all manufacturer sponsored training and certifications held.

C. Contractor must apply for and secure all permits required by the State and / or Local Municipalities having jurisdiction over the project location.

D. Contractor is to examine the Contract Documents and jobsite to obtain first-hand knowledge of existing conditions and project requirements. The Tendering of a Proposal / Bid Submission for the scope of work defined within will be taken as

evidence the Contractor has reviewed the Contract Documents in their entirety, understands the scope of work required, and takes no exceptions to the design, scope of work, existing conditions, and / or project schedule, unless it is clearly listed as an exclusion within the body of the proposal. Bid Submission indicates the Contractor has examined existing conditions, acknowledges site conditions, and has mad allowances for said conditions and all related project costs. Additional requirements can be found in the “Proposal Tender” section of this document.

1.3 DEFINITIONS

A. Following is a listing of abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1.	A	Ampere
2.	AA	Automatic Attendant (see CAS)
3.	AC	Alternating Current
4.	ACD	Automatic Call Distribution
5.	AFF	Above Finished Floor
6.	AG	Above Grade
7.	AHJ	Authority Having Jurisdiction
8.	AP	Access Point
9.	ARS	Automatic Route Selector
10.	AVI / O	Audio Visual Input / Output Plate
11.	AWG	American Wire Gauge
12.	BFC	Below Finished Ceiling
13.	BGM	Background Music
14.	BICSI	Building Industry Consulting Service International
15.	C	Conduit
16.	CAS	Centralized Attendant Service (see AA)
17.	CATV	Cable Television (Community Antenna)
18.	CCTV	Closed Circuit Television (Surveillance, see VSS)
19.	CDR	Call Detail Record
20.	CKT	Circuit
21.	CLEC	Commercial Local Exchange Carrier (local utility, telephone company)
22.	CLG	Ceiling
23.	CNTL	Control
24.	CO	Central Office
25.	COND	Conductor
26.	CMS	Customized Music Service
27.	CPU	Central Processing Unit (PC, computer)
28.	CRT	Cathode Ray Tube
29.	CU	Copper
30.	DA	Distribution Amplifier
31.	DAS	Distributed Antenna System (cellular phone repeater system)
32.	dB	Decibel

33.	dBm	Unit of Power
34.	dBv	Unit of Voltage
35.	dB-SPL	Unit of Sound Pressure Level (volume)
36.	DC	Direct Current
37.	DCP	Door Control Panel (access control)
38.	DED	Dedicated Circuit
39.	DID	Direct Inward Dial
40.	DIM	Dimmer
41.	DND	Do Not Disturb
42.	DTMF	Dual Tone Multi Frequency (dial tones)
43.	DVI	Digital Video Interface
44.	DVI-D	Digital Video Interface – Digital (only)
45.	DVI-I	Digital Video Interface – Integrated (analog)
46.	E	Emergency / Existing (reference all information for context)
47.	EC	Electrical (sub) Contractor
48.	EIA	Electronics Industry Association
49.	ER	Equipment Room (see MDF)
50.	ETR	Existing To Remain (also E / R)
51.	EX	Existing
52.	FA	Fire Alarm
53.	FACP	Fire Alarm Control Panel
54.	FGM	Foreground Music
55.	FL	Floor
56.	FPS	Frames per Second
57.	G or GND	Ground
58.	GHz	Gigahertz
59.	H or HT	Height
60.	HDMI	High Definition Multimedia Interface
61.	HH	Handhole
62.	Hz	Hertz (frequency, cycles per second)
63.	IDF	Intermediate Distribution Frame (see ITC, TC, or TR)
64.	IDP	Intrusion Detection Panel (burglar alarm)
65.	IEEE	Institute of Electrical & Electronics Engineers
66.	IG	Isolated Ground
67.	IP	Internet Protocol
68.	IPS	Images per Second
69.	IR	Infrared
70.	ISDN	Integrated Services Digital Network
71.	ISO	Isolated
72.	ITC	Information Technologies Closet (see also TC)
73.	K	Kilo – thousand
74.	KSU	Key Switching Unit (private telephone system – see PBX)
75.	LAN	Local Area Network (see WAN)
76.	LCD	Liquid Crystal Display
77.	LCR	Least Cost Routing (telephony) Left-Center-Right (audio)
78.	LED	Light Emitting Diode
79.	LIU	Lightguide Interconnection Unit – aka: Lightguide, Optical Fiber Patch Panel, Fiber Patch Panel

80.	LP	Line Printer
81.	LV	Low Voltage
82.	MAC	Moves, Adds, Changes
83.	MATV	Master Antenna Television (see CATV)
84.	MDF	Main Distribution Frame (Main Computer Room – IT Head End)
85.	MH	Manhole
86.	MHz	Megahertz
87.	MON	Monitor
88.	MPEG:	Moving Picture Experts Group
89.	MPOE	Main Point of Entrance (Public Utility Demarcation Point)
90.	MPx:	Mega Pixel
91.	MT	Mount
92.	MTG	Mounting
93.	MUR	Make Up Room
94.	MUX	Multiplexer
95.	NC	Normally Closed
96.	NEC	National Electrical Code
97.	NFPA	National Fire Protection Association
98.	NIC	Not In Contract
99.	NID	Network Interface Device (Optical Fiber Tx / Rx Interface – see ONT)
100.	NO	Normally Open
101.	NTS	Not To Scale
102.	NTSC:	National Television System Committee
103.	OC	On Center
104.	ONT	Optical Network Transceiver (Optical Fiber Tx / Rx Interface / NID)
105.	P	Public
106.	PA	Public Address
107.	PBX	Private Branch Exchange (private telephone system – see KSU)
108.	PC	Personal Computer
109.	PIR	Passive Infrared Device (motion detector)
110.	PoE	Power Over Ethernet
111.	PMS	Property Management System
112.	POS	Point Of Sale
113.	POTS	Plain Old Telephone System (analog)
114.	PR	Pair(s)
115.	PRT	Printer
116.	PSTN	Public Switched Telephone Network
117.	PTZ	Pan-Tilt-Zoom
118.	PVC	Polyvinyl Chloride
119.	QOS	Quality of Service
120.	R	Relay
121.	RC	Remote Control
122.	RCC	Residential Consolidation Cabinet
123.	RCDD	Registered Communications Distribution Designer
124.	REF	Reference
125.	RF	Radio Frequency
126.	RGB	Red-Green-Blue
127.	RGB / Hv	Red-Green-Blue / Horizontal-Vertical

128.	RGB / S	Red-Green-Blue / Sync
129.	RP	Remote Printer
130.	RU	Rack Unit (1.75” clear rack mounting space)
131.	SATV	Satellite Antenna Television
132.	SH-I	Shielded Individually (twisted pairs)
133.	SH-O	Shielded Overall
134.	SMDR	Station Messaging Detail record
135.	SR	Sound Reinforcement
136.	SS	Stainless Steel
137.	SVGA	Super Video Graphics Adaptor
138.	SW	Switch
139.	SWBD	Switchboard
140.	TBA	To-Be-Arranged (location – see TBD)
141.	TBB	Telephone Backboard
142.	TBD	To-Be-Determined (location, quantity – see TBA)
143.	TC	Terminations Closet (see IDF, ITC, TR)
144.	TCP:	Transmission Control Protocol
145.	TDM	Time Division Multiplexing
146.	TDMM	Telecommunications Distribution Methods Manual
147.	TEL	Telephone
148.	TGB	Telecom Grounding Busbar
149.	TIA	Telecommunications Industry Association
150.	TP	Twisted Pair
151.	TR	Telecommunications Room (see IDF, ITC, TC)
152.	TRB	Building Telecommunications Room (see MDF, ER)
153.	TRM	Time Resource Monitor (Time Clock)
154.	TSYS	Technology Systems
155.	TV	Television
156.	TVL	Television Lines (analog CCTV)
157.	TYP	Typical
158.	UDP:	User Datagram Protocol
159.	UG	Underground
160.	UHF	Ultra High Frequency - RF (300MHz to 2.0GHz)
161.	UL	Underwriter’s Laboratory
162.	UON	Unless Otherwise Noted
163.	UPS	Uninterruptable Power Supply
164.	USP	Unified Security Platform (software)
165.	UTP	Unshielded Twisted Pair (CAT-5e / 6 network cabling)
166.	V	Volts
167.	VA	Volt-Ampere
168.	VGA	Video Graphics Adaptor
169.	VHF	Very High Frequency - RF (30Mhz to 300MHz)
170.	VMS	Video Management Software (enterprise class)
171.	VP	Vapor Proof
172.	VR	Vandal Resistant
173.	W	Watts
174.	WAN	Wide Area Network (see LAN)
175.	WDM	Wavelength Division Multiplexing
176.	WP	Weatherproof

177. XFMR Transformer
178. XHF Extremely High Frequency - RF (2.0HGz and above)
179. XP Explosion Proof

1.4 PROPOSAL TENDER

A. Contractor is to examine the Contract Documents and jobsite to obtain first-hand knowledge of existing conditions and project requirements. The Tendering of a Proposal / Bid Submission for the scope of work defined within will be taken as evidence the Contractor has reviewed the Contract Documents in their entirety, understands the scope of work required, and takes no exceptions to the design, scope of work, existing conditions, and / or project schedule, unless it is clearly listed as an exclusion within the body of the proposal. Bid Submission indicates the Contractor has examined existing conditions, acknowledges site conditions, and has mad allowances for said conditions and all related project costs.

B. Where work is to be performed in an existing structure, the Contractor shall coordinate all work, including the interruption of utilities and building services with the Owner or Building Management. Phasing of work is to be performed and coordinated to accommodate existing facility operations.

C. Requirements of the current edition of Building Rules and Regulations published by the Building Management shall be incorporated into this work.

D. Contractor shall be responsible for Costs and work associated with cutting and patching of existing facility as required to complete this scope of work. Affected areas shall be restored or repaired to leave in “line-new” condition and matching surrounding surfaces.

E. Contractor shall be responsible for costs associated with Building Utility equipment shutdowns and fire watches.

F. Should stoppage of work occur, the contractor shall leave the facility in a weather tight condition. Occupied facilities systems shall be left in an operational stat to allow continued normal facilities operations.

G. Verify existing locations of switchgear, panelboards, fire alarm panels and devices, communications backboards and terminations, security systems, audio visual systems, etc. Contractor shall provision for requirements to interconnect existing systems to new scope of work.

H. Base Bid: Proposals Tendered under this and related Sections are to be fixed fee proposals. Proposals Tendered must include the equipment and systems as specified within the Contract Documents. Contractor’s base bid must include all equipment and systems as designed.

I. Substitutions: Options for equipment substitutions tendered at the time of the proposal must be accompanied with a statement of benefit or savings realized. Substitutions must be presented as additive or deductive line-item alternates to

the base bid. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment. Manufacturer's cut sheets for proposed substitutions must accompany each request.

J. Proposal Components:

1. Equipment Lists: A complete and detailed equipment list indicating manufacturer, model, quantities, and line item pricing.
2. Total Installed Cost: Total fixed fee installation costs for complete and operational system as defined in the Contract Documents. Proposal must have the following broken out as separate line-item subtotals.
    a. Equipment (hardware)
    b. Programming (system configuration)
    c. Installation (labor / commissioning)
    d. Preventative Maintenance / Service Agreements
    e. Extended Warrantees
3. Simplified Schematics: One-line drawings of systems indicating bidders understanding of the equipment required and how it is to be configured.
4. Business References: List three for projects of similar size, scope, and budget.
5. Workforce Documentation: Provide personnel hierarchy showing key personnel and project chain of command.
6. Project Schedule: Gantt chart defining key project milestones

K. The Consultant cannot accept phone calls, e-mails, or other correspondence directly from bidders and / or sub-contractors regarding the Contract Documents during the bidding phase. All questions and / or requests for clarification must be forwarded in writing to the Architect / Engineer. The Consultant will prepare a written response to questions within three days of receipt, which will be distributed to all bidders as bid clarifications.

1.5 SUBMITTALS

A. Technology Systems are designed and specified as systems, not individual products. As such, submittals without both product information and shop drawings cannot be properly evaluated with respect to the Contractors understanding and interpretation of the Contract Documents.

B. Contractor Submittals (separate submittals by system) are required for each of the systems and Specification Sections referenced in Part 1.1.D of this section. All required items for each section must be submitted together. Partial or incomplete submittals will be returned rejected.

C. Submittal packages are intended to be the basis of complete and detailed installation and closeout documentation packages. Submittal packages are also

intended to reflect the Contractors understanding and interpretation of the Contract Document design intent. As such, submittals are required to reflect the level of detail needed by installation personnel for the installation and commissioning of each system as designed.

D. When required by individual Sections, submittals packages are to be constructed and organized by specification section. Where two or more systems require integration and inter-coordination by the Contract Documents, the Contractor is encouraged to submit all inter-related systems and sections together. (i.e.: Surveillance & Access Control / Duress / Door Monitoring; and / or Sound Systems, User Interface & Control, & Equipment Racks).

E. The Contractor is required to review each submittal package for completeness and adherence to the Contract Documents before submitting. Evidence of this review shall be indicated by Contractor's stamp, signature of reviewer, date of review, and a statement indicating compliance with the Contract Documents clearly displayed on the cover sheet of each submitted section. Submittals received without evidence of Contractor's review will be rejected.

F. The Contractor must present a submittal schedule to the Architect / Engineer for review and acceptance. This mutually agreeable submittal schedule must include Submittal Number, Specification Number, and anticipated date when submittal is expected to be tendered. Once the schedule is accepted by the Architect / Engineer, submittal packages must be tendered on the dates indicated.

G. Submittals must demonstrate product / system conformance to the Contract Documents.

H. Submittal Components:

1. Product Data: Manufacturer Cut Sheets for each type of product indicated. Cut sheets to include information on rated capacities, performance characteristics, operational features, dimensions, weights, power requirements, heat release, furnished specialties, and / or accessories.

    a. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options must be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor must clearly indicate which model / type is being provided for each application.
    b. Unless specifically requested, the Contractor shall not submit manufacturer product data in the form of owner's manuals, operations manuals, installation manuals, and / or non-English publications or sheets. Information received in this manner will be rejected and returned un-reviewed.

c. Owner's manuals, operations manuals, and installation manuals are a part of required Closeout Documents / Record Drawings.

2. One-Line / Block Diagrams: Submittals of systems requiring the interconnection of multiple product types or the inter-coordination of multiple systems must contain one-line and / or block diagrams indicating the specifics of interconnection for the specific systems / product types provided.

   a. One-Line Diagrams must identify each piece of equipment being installed, sizes and quantities of conductors, cable numbering / identification scheme, and connector & terminations information.
   b. Signal and control connections must identify communications protocol, where this is otherwise not clear.
   c. One-Line / Block Diagrams submitted for approval must be specific to this project and not typical and / or case study drawings.
   d. Reproduction of any part of the Contract Documents as a basis for submittal components is prohibited. Submittals containing portions of the Contract Documents will be rejected.

3. Initial System Programming: Submit initial / planned system programming with written narrative and initial screen graphics.

4. Shop Drawings (Special Fabrications / Custom Integration): Shop Drawings illustrate and document special and / or custom manufactured products, input / output connector plates, items, prototypes, and / or mounting assemblies specifically manufactured for installation on this project. Shop Drawings must contain dimensions, construction details, parts lists, materials listings, and illustrations of any etching and / or custom artwork to be included. If said assembly weighs or is used to mount equipment weighing over 25 lbs., the Shop Drawing must contain a structural engineer's evaluations and approvals.

5. Rack Elevations: Equipment Rack layouts (elevations) reflecting each major piece of equipment installed, its relative vertical size, and its position within the rack.

6. Equipment Lists: Equipment Lists submitted as a part of required submittal packages will be reviewed for conformance with Contract Documents and general errors and / or omissions. Equipment Lists must contain each major piece of equipment listed by model number, manufacturer, and quantities provided. Minor equipment / hardware must be listed in lump sum / category fashion. Line item pricing of each equipment category is encouraged to allow for budget review, if necessary. Quantities will not be reviewed for accuracy.

7. Product Samples: The Architect / Engineer reserves the option to require samples of materials submitted for approval for evaluation and review. Product demonstrations may be acceptable in lieu of samples for certain equipment / material types.

8. Substitution Requests:
    a. Substitution requests must be accompanied with a written statement of benefit or savings realized.
    b. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment.
    c. Manufacturer's cut sheets for proposed substitutions must accompany each request.
    d. Where substitutions alter the space requirements of equipment locations reflected in the Contract Documents, the Contractor is required to submit revised drawings indicating proposed layout of equipment.
9. Statement of Manufacturer's Warrantee for completed Structured Cabling System. Statement must include length of warrantee and performance level warranted

I. Review and responses to Contractor submittals by the Consultant, including any review annotations, comments, and / or stamp notations, do not imply approval or acceptance of the Contractor's installation plan. Review of submittals and product data is for general compliance of the Contractor's installation plan with the Contract Documents.

J. The direct reproduction of any part of the Contract Documents for use as a part of required submittals is not acceptable. Submittals containing reproduced Contract Documents will be returned un-reviewed.

K. Submittal review comments do not relieve the Contractor from required compliance with the Contract Documents, nor do they modify, amend, or nullify any part of the Contract.

1.6 CLOSEOUT DOCUMENTS / RECORD DRAWINGS

A. Closeout Document packages are required for each of the systems referenced and Specification Sections listed in Part 1.1.D of this section. At the time of final inspection, deliver five (5) sets of complete installation data on the Technology Systems installed as a part of this contract.

B. Closeout Document Packages are an extension of the product / system submittals tendered at the beginning of the installation and are intended to function as complete and detailed Owners, Operators, and Maintenance manuals.

C. Closeout Document Package must contain written certification that the system was installed in accordance to the Contract Documents, Manufacturer's recommendations, and industry best practices.

D. Closeout Package Components:

1. Operations and Maintenance Manuals: Operations, Service, and / or Maintenance manuals will be substituted for Manufacturer Cut Sheets submitted as a part of the required Closeout Document Packages. The Operations and Manuals component must include layman's level operating and maintenance instructions for each system. This should include information on basic system troubleshooting procedures.
2. As-Built Diagrams: As-Built Diagrams are an extension of the One-Line / Block Diagrams tendered at the beginning of the installation. As-Build Diagrams will include any and all field modifications, locations, revisions, and / or VE changes. As-Built Diagrams will include all cable marking / identification tag information.
3. Equipment Lists: Equipment Lists are to include quantity values for all installed major electronics (including serial numbers), field devices, test equipment, and / or manufactured assemblies.
4. Test & Commissioning Results: Hardcopy and electronic results from all required testing, analysis, measurements, and / or commissioning.
5. Software and Programming: Full submittal of all electronic systems programming is to include copies / licenses of the latest versions of the manufacturers supplied software, copies of the latest firmware updates, the physical source code (both electronic and paper), listings of control actions and reactions (RS-232 / 422 / 485 / ASCII / HTML / C++ / Visual Basic). The Contractor, Integrator(s), Installer(s), and / or Programmer(s) employed to perform this scope of work implicitly and explicitly transfer all intellectual property rights for said programming, algorithms, manuals, configurations, software code, and / or any other created works developed in the execution of this work, to the Owner.
6. Statement of Warrantee: Contractor to provide written statement of warrantee for each system installed as a part of this work. Written statement of warrantees should be provided for each Specification Section listed in Part 1.1.D of this section.
7. Completed Warranty & Product Registration Cards: Contractor must complete, address, and provide postage for all manufacturer warrantee and / or registration cards for each piece of equipment delivered and installed. The Contractor must use the final system acceptance date as the date said equipment was placed into service. Completed warrantee and / or registration cards with proper postage affixed are to be delivered to the Owner / Operator as a part of the Closeout Documents.
8. Maintenance and Operations Materials: Furnish extra materials / spare parts / maintenance items that match products delivered and installed:

    a. Operations Manuals - three (3) complete for each system installed
    b. Keys – six (6) sets
    c. Patch Cables – 10% spares
    d. Credential Card Blanks – 25% quantity supplied or minimum 20 spare
    e. Fuses – 10% of all kinds installed

f. Touch-up Paint – one bottle each color
g. RFID Tags – 25% quantity supplied

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Materials and equipment submitted must be capable and rated for the environmental conditions for which they are intended to be installed:

1. Control Station / Head-end: Rated for continuous operation in ambient temperatures of 60 to 85 deg. F and a relative humidity of 20 to 80 percent, noncondensing.

2. Interior, Controlled Environment: System components, except central-station control unit / head-end, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 45 to 80 deg. F dry bulb and 20 to 80 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

3. Interior, Uncontrolled Environment: System components installed in non-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 32 to 122 deg. F dry bulb and 20 to 80 percent relative humidity, noncondensing. Use NEMA 250, Type 12 enclosures.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg. F dry bulb and 10 to 100 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 4X enclosures.

1.8 WARRANTIES, MAINTENANCE, AND REMEDIATION

A. Integration Warranty: The Contractor must warrant each installed system against defects in materials and workmanship, including labor and parts, for a period of one year from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Equipment Manufacturer’s Warranty: Manufacturer's standard form warranty in which manufacturer agrees to repair or replace components of Technology Systems equipment that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: One year from date of system Final Acceptance.

C. Service Calls: During the period of the General Warranty, the Contractor must respond to service requests within twenty-four (24) hours of receipt of request.

1. Service Calls performed under the conditions of the General Warranty must be performed at no charge.
2. The Contractor may recoup his costs if service request is determined to be due to one or more of the non-covered failures (27 0500-1.8-A.1).
3. The Contractor must absorb the cost of up to two (2) Service Calls during the period of the General Warranty where the reported problem(s) cannot be identified, observed, or confirmed. These Service Calls are unique and distinct from Scheduled Maintenance visits required in section E below, unless specifically arranged and agreed to by Owner in advance.

D. Equipment Repair: The Contractor must provide like-kind temporary equipment on a “loaner” basis if repairs to defective equipment cannot be affected within twenty-four (24) hours of the Service Call. The temporary item(s) must be replaced with the original units after successful repair.

E. Scheduled Maintenance: The Contractor must schedule two inspection / preventative maintenance visits within the period of the General Warranty for purposes of gathering user feedback of problems and to provide functional inspections and checks of system operation.

1. The first visit to be scheduled six (6) months after Final Acceptance, the second within 30 days before the expiration of the General Warranty period.
2. Scheduled Maintenance visits are unique and distinct from any requested Service Calls (section B above), unless specifically arranged and agreed to by Owner in advance.

F. Owner Provided Equipment: Owner Provided Equipment delivered to the Contractor in new condition for installation and integration at the time of system(s) installation must be considered as covered by paragraphs C and E above.

1. “Used” Owner Provided Equipment delivered at the time of original system installation, or, Owner Provided Equipment integrated after system Final Acceptance, are exempt from this requirement.

1.9 QUALIFICATIONS

A. Technology Systems Installers tendering proposals for work defined in this and Sections defined in part 1.1.D must meet the following qualifications.

1. Must be regularly engaged in the installation, fabrication, and maintenance of commercial Technology Systems.

2. Must demonstrate as a part of the proposal tender package successful the completion of at least two projects with similar size and scope within the past 60 months.
3. Must demonstrate they are manufacturer authorized dealers for the systems / major equipment items to be installed under this scope of work.
4. Must demonstrate they possess sufficient facilities and staff to implement this scope of work.
5. Must maintain suitable service facilities, test equipment, and personnel for system(s) to be installed.
6. Must meet all requirements of the local Authority Having Jurisdiction (AHJ) for the municipality in which this work is to be performed.

PART 2 - MATERIALS

2.1 PRODUCTS AND EQUIPMENT

A. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification.

C. Products and / or Equipment connected to the electrical system (branch circuit power) must be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where the Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors, provide all required items (by system) from a single manufacturer (i.e.: provide all rack frames, speakers from a single manufacturer, UON).
3. Where the Contract Documents require materials of devices designed to be mounted within or as sub-assembly of another product, provide all required items from a single manufacturer.

4. Where the Contract Documents require product that must form a rated, warranted system, provide all required items / components from a single manufacturer and provide written documentation of manufacturers required testing and warrantee.

E. Not every product listed in Part 2 of the Technology Specifications may be required by the project design. Reference floorplan drawings, one-line diagrams, schedules, and details in addition to Technology Systems specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed must bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

2.2 SUBSTITUTIONS

A. Products and / or Equipment are to be selected from Acceptable Manufacturers / Basis of Design products found in drawings and specifications. In the event an alternate product is desired to be evaluated for substitution, each product substitution must be accompanied with a statement of availability, benefit, or savings realized. Substitutions must be presented as additive or deductive line-item cost alternates to the base bid. Manufacturer's cut sheets for each proposed substitution must accompany each request.

B. Products and / or Equipment presented for substitution must meet or exceed the quality, feature set, and / or workmanship of specified products. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment. Products of lesser quality, workmanship, function, and / or design will not be considered.

C. Product substitutions that directly replace a discontinued product / model number or to match the branch circuit power requirements of the local power utility will be automatically accepted. Notice of said substitution must be provided in writing to the Architect / Engineer.

2.3 ACCEPTABLE MANUFACTURERS

A. The following terms may be used within the Technology Systems specifications as related to Product and / or Equipment and carry the following meanings:

1. EQUAL: Allows any manufacturers product which meets or exceeds the quality, performance, reliability and / or feature set of the specified product.

2. APPROVED EQUAL: Indicates the base bid must include a product from one of the indicated manufacturers, but substituted items may be

presented for approval. Substituted products must be presented as an additive or deductive alternate to the base bid.

3. If neither of the above terms is used, products submitted must be from the approved list.

4. BASIS OF DESIGN: Product listed is acceptable and forms a basis of quality for which alternate products must equal. Submit alternate products per normal submittal Substitution requirements.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Installation: All work must be performed by experienced and competent installers. Work must be executed in a neat and orderly manner, according to manufacturer's recommendations, industry "best practices," local municipal codes and ordinances, and to OSHA safety standards.

B. All wall mounted devices must be mounted plumb and square at locations defined in the contract documents.

C. All permanently installed equipment must be firmly attached to structure. Support hardware must be rated to support five times the static load. Equipment and / or devices weighing over 50 lbs., devices suspended overhead, and / or equipment and / or devices presenting a dynamic load must be reviewed and approved by a licensed structural engineer. It is the Contractors responsibility to identify these conditions and secure said approvals.

D. Project Documentation: The Contractor must make available on-site, at all times, a full set of the Technology Systems Design & Contract Documents (drawings and specifications) for reference by the installation team. The installation team must have on-site, full sets of the installation documents (reviewed and approved shop drawings and submittals).

E. Coordination: Contractor must coordinate with other trades to avoid delays and assure a successful installation. Contractor must take all actions required to meet the accepted construction schedule including, but not limited to; expedited delivery of materials, scheduling of additional work force, and / or scheduling extended work hours. Coordination must begin prior to the installation of any materials or equipment and must continue throughout the project duration. Coordinate Technology Systems device locations with Interior Design documents and other trades.

F. Special Coordination:

1. Raceway Installer: Deliver all manufacturer specific / specialty back boxes, junction boxes, outlet boxes, wire ways, troughs, and or cable carrying mounting assemblies to raceway installer before the beginning of work. Schedule delivery of specialty boxes and assemblies to assure

timely installation consistent with accepted project schedules. Contractor must inspect and review Technology Systems raceways after installation and alert Architect, Engineer, and Raceway Installer in writing of any deficiencies found. Deliver copies of the Technology Systems Project Documentation (design and shop drawings) to the Raceway Installers along with the specialty enclosures to be installed.

2. Other Trades: Contractor must review design documents by Interior Design, Electrical, Mechanical, Door Consultant and others for impact on Technology System scope of work.

3.2 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION - SPECIAL CONDITIONS

A. Equipment Racks: All equipment must be permanently installed. Products and / or Equipment designed for installation into equipment racks must be installed and secured into a metal, EIA Standard rack as specified elsewhere in the Contract Documents.

1. Provide sufficient ventilation and mounting spacing for proper operation and cooling.

2. All cabling installed within Equipment Racks must be securely attached to the internal framework, cable lacing bars, and / or cable management products.

3. Any vertical front rack space unoccupied by equipment is to be filled with appropriate blank and / or vent panels.

4. Secure Equipment Racks firmly to structure (unless specified as "on wheels"). Take all structural, seismic, and required work clearances into consideration when attaching to structure.

B. Wireless Operation: Systems with components that provide wireless operation (RF, IR, WiFi) must be installed with their transmit / receive apparatus (antennas,

IR sensors / emitters, Access Point) at a location where full functional operation of the wireless component of system operation can be achieved. Provide and install additional transmit / receive apparatus to provide additional coverage in areas with inadequate coverage, if a single transmit / receive apparatus fails to provide satisfactory operation.

C. Programming: Systems with components requiring software configuration and / or programming for complete and proper operation must be provided complete with required programming. Deliver to Owner latest copies of source code, licenses of required software, hardware soft-patch upgrades, firmware, security patches, manufacturer provided system configurators, soft terminals, middleware, interfaces, and / or compilers. Ownership of all intellectual property rights over final system programming and / or source code must be transferred to the Owner at the point of system Final Acceptance.

D. Analog Audio Distribution: Where unbalanced analog audio signals are required to be distributed or transported over copper cabling for distances exceeding 20', provide unbalanced-to-balanced impedance matching devices (BALUN's) or active distribution amplifiers to eliminate the potential of audible ground loops.

E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

F. Uninterruptable Power Supplies (UPS): Refer to individual system Specification Sections for required run times and connected equipment. Provide UPS battery size calculations as part of submittals.

3.4 WIRING INSTALLATION

A. Comply with NECA 1, "Good Workmanship in Electrical Construction" for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Cabling entering enclosures: Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12’ AFF. Cabling may be installed free run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12’ AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48” cabling pre-termination loop at field devices (free run cabling, no service box).

2. Box Mounted Jack Plates: Provide a minimum 18” cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.
3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

L. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations

M. Terminations: All cable terminations must be made in compliance with industry standards, manufacturer recommendations, and the following:

1. Solder connections must be made with rosin core solder. Soldered connections must be clean and free from evidence of cold solder joints.
2. Fully terminate all installed conductors to required terminals, IDC blocks, connectors, patch points, and / or panels. Provide sufficient quantity of termination points to accommodate all conductors.
3. Provide appropriately sized service loops at each termination point.
4. Unless otherwise noted, all cabling must be installed contiguous between devices and un-spliced.
5. Terminal Blocks: Connections to screw-type terminal blocks must be made using soldered, crimp style, non-insulated spade lugs.
    a. Spade lugs must match both AWG size of the conductor being terminated and the terminal screw diameter.
    b. Crimp connections must be made according to manufacturer’s recommended practices with manufacturer’s recommended crimp tool(s).
    c. Solder conductors to crimped, non-insulated spade lug before fastening to screw terminal.

6. Eurostyle Terminal Blocks / Phoenix Blocks: Connections to captive screw, Eurostyle Terminal Blocks must be made as per the following:

    a. Rising cage clamp must match AWG size of the conductor being terminated.
    b. Twist and solder (tin) the exposed conductors of each wire being terminated. Remove only the length of insulation from conductor required to terminate wire within the block.
    c. Secure each conductor with manufacturers recommended torque on the rising cage screw assembly.
    d. Follow equipment manufacturer's pin configurations when terminating conductors.

7. XLR Style Audio Connectors Connections to soldered lead, multipin connectors.

    a. Terminate XLR Style connectors according to IEC-268.

        1) Connect cable shield to Pin 1.
        2) Connect circuit "hot" to Pin 2
        3) Connect circuit "low" to Pin 3

    b. Twist and solder (tin) the exposed conductors of each wire being terminated.
    c. Securely solder each conductor to the terminals unless IDC terminations had been provided.

N. Cable Identification: Each wire and / or cable installed must be permanently identified with legibly printed, unique cabling identification label. Cable Labeling must conform with ANSI / TIA / EIA-606-A/B and the following:

1. Cabling Identification label must be mechanically printed. Handwritten cabling identification labels are not acceptable except for temporary identification during installation. Handwritten labels must be replaced with mechanically printed labels.
2. Cabling Identification labels must be affixed to each cable within 4" of termination, both ends.
3. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to and cable type.

O. Grounding: Take all necessary precautions to minimize electromagnetic and / or electrostatic interference. Grounding bars in equipment racks must be bonded to grounding bars in equipment rooms, IDF, and / or building ground system. Comply with NEC Article 250.

3.5 TRAINING

A. Contractor must provide a minimum of four (4) hours of training on each major Technology System installed.

1. Training is to be conducted by a lead or supervisorial level technician with thorough knowledge of this specific installation.
2. Contractor will video record each training session conducted, if requested by the Owner.
3. Contractor to deliver recorded training on DVD media.

B. First Major Use: Contractor must provide one lead or supervisorial level technician with thorough knowledge of this specific installation for the First Major Use of the completed system(s).

1. The role of the Contractors representative will be for quality assurance, operator supervision, troubleshooting and debugging, and advanced training.
2. The Owner and Consultant will collaborate and determine what event comprises the First Major Use.
3. Contractor to budget for a minimum of two (2) separate two (2) hour events satisfying this requirement.
4. No video recording of these sessions is required.

END OF SECTION 27 0500

SECTION 27 1100 – COMMUNICATIONS EQUIPMENT ROOMS & FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. Contract Document drawings indicate general locations and quantities of the Communications Equipment Rooms & Fittings. The design documents are for general guidance and reference in understanding the design intent. Exact routing, placement, distances, elevations, and orientation of the Communications Equipment Rooms & Fittings components will be determined by the Architect, Network Administrator, and other engineering design documents, as well as field conditions.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional requirements.

D. Coordinate the requirements of this system with those listed systems in 27 0500-1.1. D.

1.02 REQUIREMENTS

A. This section provides requirements for communications related improvements, assemblies, and preparations required within Public Utility Main Point of Entrance Rooms (MPOE), Equipment Rooms (ER), Terminations Closets (TC), Main Computer Rooms (MDF), Intermediate Telecom Closets (ITC), IDF's, CATV Rooms. These elements include:

1. Floor Mount Terminations Racks
2. Wall Mount Racks
3. Vertical / Horizontal cable Managers
4. Lightguide Interconnection Units (LIU)
5. UTP Patch Panels
6. UTP Patch Cables
7. UTP Cross Connects
8. IDC Terminations Blocks
9. Backboards
10. Grounding Bars (TGMB / TGB)
11. Cabling Ladder Rack
12. Telecommunications Mounting Hardware
13. Riser Sleeves and Firestopping
14. Side Wall Cabling Penetration Products and Firestopping

B. Communications Equipment Rooms (ER), Terminations Closets (TC), Main Computer Rooms (MDF), Intermediate Telecom Closets (ITC), IDF's, CATV

Rooms, shall be fully lined with equipment mounting Backboards as defined below.

C. Communications Equipment Rooms & Fittings must be coordinated with the work of Contractor, electrical installer, mechanical installer, cabling installer, Information Technology, security, audio / visual installer, and / or other trades that have work within communications rooms.

D. Coordinate Communication Room racks and / or enclosures with Owner provided equipment. Provide ample space in terminations and / or switch racks to accommodate the installation of Owner provided switches, routers, firewalls, servers, and UPS. Provide floor standing racks with a minimum of 42 rack units (RU's) of clear mounting space.

E. Furnish, deliver, and install the Communications Equipment Rooms & Fittings to be complete and operational. Provide, install, and program the Communications Equipment Rooms & Fittings to project requirements. Include any miscellaneous materials, parts, and / or supplies necessary for proper installation, but not specifically mentioned. Provide all labor, materials, and supervision to test, adjust, and calibrate to industry standards.

F. Ground and bond all Communications Equipment Room fittings per NFPA 70 and ANSI / TIA / EIA-607 requirements.

G. Environmental Conditions: Communications Equipment Rooms must be capable of maintaining the following environmental conditions:

1. Temperature: Maintain MDF and IDF spaces between 65° to 78° F (18° to 25° C).
2. Humidity: Maintain Relative Humidity of MDF / IDF spaces between 35% and 65% (non-static, non-condensing). Use NEMA 250, Type 1 enclosures.
3. Provide filtration systems where air particle levels allow dust to accumulate.
4. Heat Dissipation: heat release anticipated between 1,000 and 5,000 BTU / Hr. per active rack cabinet. Plan the following per space type:

    a. ER / MDF – 75 to 125 watts / sq. ft.
    b. CATV / PBX rooms – 50 to 75 watts / sq. ft.
    c. ITC / IDF – 25 to 50 watts / sq. ft.
    d. TC – 0 to 25 watts / sq. ft.

1.03 DEFINITIONS

A. Following is a listing of system specific abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1.	CLEC	Commercial Local Exchange Carrier
2.	ER	Equipment Room – primary IT space containing servers, core switches, and edge switches. May contain the utility MPOE.
3.	FTP	File transfer protocol
4.	IDF	Intermediate Distribution Frame (secondary terminations space – also TC / ITC)
5.	IP	Internet protocol
6.	LAN	Local area network.
7.	MDF	Main Distribution Frame (primary IT Equipment space – also ER)
8.	MPOE	Main Point of Entrance (public utility demarcation location)
9.	PC	Personal computer.
10.	TC	Terminations Closet (ITC / IDF) – closet housing local edge switches, network equipment,
11.	TCP	Transmission control protocol - connects hosts on the Internet
12.	TGB	Technical Ground Bar
13.	TMGB	Technical Main Ground Bar
14.	UPS	Uninterruptible power supply
15.	WAN	Wide area network.

B. Reference Specification Section 27 0500-1.3 for a more comprehensive listing of definitions.

1.04 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.05 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals must be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each product type provided in Part 2 - Products. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options must be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor must clearly indicate which model / type is being provided for each application.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

1.06 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals must be made in compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

1.07 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where “Approved Equal” is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following:

1. BICSI Telecommunications Distribution Design Manual (TDDM)
2. BICSI Customer Owned Outside Plant Design Manual (CO-OSP)
3. Americans with Disabilities Act (ADA)
4. ANSI / TIA / EIA-568-B Commercial Building Telecommunications Cabling Standard
5. ANSI / TIA / EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces
6. ANSI / EIA / TIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
7. EIA / TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications
8. NFPA 70 (latest edition adopted by AHJ)
9. NEMA 250
10. ANSI / NECA / BICSI 568 Standard for Installing Commercial Building Telecommunications Cabling

1.08 WARRANTIES AND REMEDIATION

A. Integration Warranty: The Contractor shall warrant the Communications Equipment Rooms & Fittings against defects in installation and workmanship, including labor and parts, for a period of one year from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Equipment Manufacturer's Warranty: Manufacturer's standard form warranty in which manufacturer agrees to repair or replace components and / or equipment that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: One year from date of system Final Acceptance.

C. Reference Specification Section 27 0500-1.8 (Technology Systems - General Conditions) for additional warranty and remediation requirements.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Communications Equipment Rooms (ER), Terminations Closets (TC), Main Computer Rooms (MDF), Intermediate Telecom Closets (ITC), IDF's, CATV Rooms, shall be fully lined with equipment mounting Backboards as defined below.

B. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

C. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards.

D. Products and / or Equipment connected to the electrical system (branch circuit power) shall be provided with the same ratings as the local utility (both voltage and frequency).

E. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors, provide all required items from a single manufacturer (i.e.: provide all rack frames from a single manufacturer, UON).
3. Where the Contract Documents require materials of devices designed to be mounted within or as sub-assembly of another product, provide all required items from a single manufacturer.
4. Where Contract Documents require product that must form a rated, warranted system, provide all required items / components from a single manufacturer and provide written documentation of manufacturers required testing and warrantee.

F. Not every product listed in Part 2 of the Technology Specifications may be required by project design requirements. Reference floorplan drawings, one-line diagrams, schedules, and details in addition to Technology Systems specifications for the complete design intent.

G. Products and / or Equipment required by the Authority Having Jurisdiction (AHJ) to be UL listed must bear the UL logo.

H. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system shall be furnished and installed.

2.02 FLOOR STANDING EQUIPMENT RACKS (ENCLOSED)

A. Floor Standing Equipment Racks provided shall be 19” EIA standard enclosed rack assemblies designed to support system electronics, network servers, power supplies, UPS, and other required system equipment / electronics.

B. Floor Standing Racks must possess the following features:

1. Manufactured #14-gauge or heavier baked on powder-coat finished steel
2. Complies with EIA specifications for rack mounts (ANSI / EIA RS-310-D)
3. Provide with 42 to 45 standard rack units (RU) clear mounting space (UON).
4. Have mounting rails with #10-32 tapped, 5/8” to 5/8” EIA standard rack-mounting-hole pattern. Products with nut inserts / cage nuts not acceptable
5. Be provided with appropriate side panels and front / rear locking doors to fully enclose and protect equipment mounted within.
6. Be provided with manufacturers seismic bracing, where required.
7. Load rating of 1,200 lbs. or greater
8. UL Listed

C. Preferred Floor Standing Racks are to be heavy duty, welded assembly design.

D. Acceptable Products – Floor Standing A/V, Audio

1. Atlas 502 Series
2. Middle Atlantic Products DRK, WRK, MRK, ERK, BRG Series
3. Equal by Ortronics
4. Equal by Siemon
5. Equal by Winsted
6. Equal by Lowell
7. Equal by Elkay
8. Equal by Chatsworth
9. Approved Equal

2.03 CABLE MANAGEMENT RACKS (FLOOR STANDING TWO-POST)

A. Cable Management Racks (two-post) to be provided are 19” EIA standard frame assemblies designed to support and mount patch panels, network switches, power supplies, UPS, and other required network equipment / electronics.

B. Cable Management Racks must possess the following features:

1. Manufactured of aluminum or baked on powder-coat finished steel
2. Complies with EIA specifications for rack mounts (ANSI / EIA RS-310-D)
3. Provide with 42 to 45 standard rack units (RU) clear mounting space (UON)
4. Have mounting rails with #12-24 tapped, 5/8” to 5/8” EIA standard rack mounting hole pattern. Products with nut inserts / cage nuts are not acceptable.
5. Manufactured with both front and rear facing tapped mounting rails.
6. Be provided with manufacturers seismic bracing, where required
7. Load rating of 1,500 lbs. or greater

C. Basis of Design Product:

1. Ortronics Mighty-Mo 6 Series
2. Ortronics Mighty-Mo 10 Series

D. Acceptable Manufacturers:

1. Ortronics
2. Chatsworth
3. Siemon Co.
4. Panduit
5. Leviton
6. Winsted
7. Middle-Atlantic
8. Hubbell
9. ADC
10. Approved Equal

2.04 WALL MOUNTED EQUIPMENT RACKS

A. Wall Mounted Racks provided shall be 19” EIA standard enclosed rack assemblies designed to support and mount patch panels, network switches, power supplies, UPS, and other required network equipment / electronics.

B. Preferred Wall Mounted Equipment Racks are to be welded, heavy duty, swing open / pivoting design.

C. Wall Mounted Equipment Racks must possess the following features:

1. Manufactured #14-gauge or heavier baked on powder-coat finished steel
2. Complies with EIA specifications for rack mounts (ANSI / EIA RS-310-D)
3. Provides 11 to 42 standard rack units (RU) clear mounting space (as required)
4. Have mounting rails with #10-32 / tapped, 5/8” to 5/8” EIA standard rack-mounting-hole pattern. Products with nut inserts / cage nuts not acceptable
5. Be provided with appropriate side panels and front / rear locking doors to fully enclose and protect equipment mounted within.
6. Be provided with manufacturers seismic bracing, where required
7. Load rating of 250 lbs. or greater
8. UL Listed

D. Basis of Design Product:

1. Chatsworth Heavy-Duty Rack (fixed design)
2. Middle-Atlantic EWR (swing open design)

E. Acceptable Manufacturers:

1. Middle-Atlantic SFR, DRW, WRS, SBX Series
2. Hoffman EWM Series
3. Quest SR Series
4. Equal by Ortronics
5. Equal by Siemon
6. Equal by Winsted
7. Equal by Lowell
8. Equal by Elkay
9. Equal by Chatsworth
10. Approved Equal

2.05 CABLE MANAGEMENT / TERMINATIONS RACKS (FLOOR STANDING TWO-POST)

A. Cable Management Racks (two-post) to be provided are 19” EIA standard frame assemblies designed to support and mount patch panels, network switches, power supplies, UPS, and other required network equipment / electronics.

B. Cable Management Racks must possess the following features:

1. Manufactured of aluminum or baked on powder-coat finished steel
2. Complies with EIA specifications for rack mounts (ANSI / EIA RS-310-D)
3. Provides 44 / 45 standard rack units (RU) clear mounting space (UON)
4. Have mounting rails with #12-24 tapped, 5/8" to 5/8" EIA standard rack mounting hole pattern. Products with nut inserts / cage nuts are not acceptable.
5. Manufactured with both front and rear facing tapped mounting rails.
6. Be provided with manufacturers seismic bracing, where required
7. Load rating of 1,500 lbs. or greater

C. Basis of Design Product:

1. Ortronics Mighty-Mo 6
2. Ortronics Mighty-Mo 10 Series

D. Acceptable Manufacturers:

1. Ortronics
2. Chatsworth
3. Siemon Co.
4. Leviton
5. Winsted
6. Middle-Atlantic
7. Hubbell
8. ADC
9. Approved Equal

2.06 VERTICAL CABLE MANAGERS

A. Vertical Cable Managers protect patch cords, cable, and equipment ports from damage by maintaining proper cabling bend radius, reducing cable tension, and providing for efficient routing of patch cords and easier cable identification.

B. Vertical Cable Managers shall be constructed of baked on powder-coated steel with smooth polycarbonate cable manager fingers. Provide and install Vertical Cable Managers complete with manufacturer supplied front covers / hinged doors.

C. Vertical Cable Managers are specifically manufactured to mate with Cable Management rack to which they are attached.

D. Basis of Design Product:

1. Ortronics #OR-MM6VMD710
2. Ortronics #OR-MM10VMD712

E. Acceptable Manufacturers:

1. Same as Cable Management Rack

2.07 HORIZONTAL CABLE MANAGERS

A. Horizontal Cable Managers protect patch cords, cable, and equipment ports from damage by maintaining proper cabling bend radius, reducing cable tension, and providing for efficient routing of patch cords and easier cable identification.

B. Horizontal Cable Managers shall be constructed of baked on powder-coated steel with smooth polycarbonate cable manager fingers.

C. Horizontal Cable Managers are specifically manufactured to mate with Cable Management rack to which they are attached.

D. Acceptable Manufacturers:

1. Same as Vertical Cable Managers / Cable Management Rack

2.08 LIGHTGUIDE INTERCONNECTION UNIT / OPTICAL FIBER PATCH PANEL (LIU)

A. Lightguide Interconnection Units (LIU) (alternately referred to as Fiber Patch Panels, Fiber Optic Patch Panels, or Optical Fiber Patch Panels) shall be modular, baked on powder-coated steel / aluminum, EIA 19" rack mount or wall mount enclosures designed to terminate, splice, interconnect, and support optical fiber terminations, lightguides, and optical fiber patch cables.

B. LIU's permit the termination, cable management, and mating of both backbone optical fiber and optical fiber patch panels routed within telecom / datacom spaces.

C. Acceptable LIU's will be provided with the following:

1. Lightguide Interconnection Units (Rack Mount)

   a. Hinged metal front panel door (may include plexiglass panel)
   b. Custom configurable interchangeable termination connector panels
   c. Clamping / strain relief mechanism to secure fiber bundle
   d. Support ST, SC, SMA, MTRJ, FC, and LC optical fiber connectors
   e. Capable of terminating up to **72 / 144 / 288** optical fiber strands
   f. Rear support, strain relief, and splice trays
   g. Patch cable management rings
   h. Labeling system to aid in optical fiber strand identification

2. Lightguide Interconnection Units (Wall Mount)

   a. Hinged metal front panel door
   b. Custom configurable interchangeable termination connector panels
   c. Clamping / strain relief mechanism to secure fiber bundle
   d. Support ST, SC, SMA, MTRJ, FC, and LC optical fiber connectors

e. Capable of terminating up to **24 / 36 / 48 / 72 / 96** optical fiber strands
f. Fiber support, strain relief, and splice trays
g. Patch cable management rings
h. Labeling system to aid in optical fiber strand identification

3. Lightguide Interconnection Units (All Styles)

a. Meet or exceeds TIA 568-B.3 requirements
b. Color coding mechanism to identify single-mode vs. multi-mode
c. UL Listed

D. Coordinate LIU connector type (ST / SC / SMA / FTRJ / FC / LC) with network Administrator before purchase.

E. Acceptable Manufacturers:

1. Ortronics
2. Leviton
3. Siemon
4. Belden
5. Approved Equal

2.09 UTP (RJ-45) PATCH PANELS

A. UTP Patch Panels shall be baked on powder-coat steel / aluminum, EIA 19" rack mounted, 2RU, assemblies designed to support and mount RJ-45 voice / data panel mount jacks and to support and terminate structure voice / data UTP horizontal cabling.

B. UTP Patch Panels may be straight, angled, or curved panels, and must each support forty-eight (48) RJ-45 jacks. UTP Patch Panels must also possess the following features:

1. 48-ports, grouped in modules of six RJ-45 jacks per module
2. Provided with 48 RJ-45 jacks (Category rated to match horizontal cabling)
3. Category Rated 110-style IDF UTP cable terminations
4. Rear cable supports / managers on back of patch panel
5. Port labeling strips that support individual port identification
6. Icon compatibility
7. EIA / TIA-T568A/B color coded wiring scheme
8. UL Listed for intended application

C. UTP Patch Panels must be provided, delivered, and installed complete from a single manufacturer. RJ-45 jacks installed within patch panel must carry the same or higher Category Rating as project horizontal UTP cabling.

D. Basis of Design Product:

1. Ortronics #OR-PHD66U48 (straight design)
2. Ortronics #OR-PHA66U48 (angled design)

3. Ortronics #OR-PHC66U48 (curved design)

E. Acceptable Manufacturers:

1. Ortronics
2. Leviton
3. Siemon
4. Belden
5. Panduit
6. Approved Equal

2.10 UTP CROSS-CONNECT

A. UTP Cross-connects are single / dual / four-pair (as required) connections between terminations blocks suitable for connecting horizontal station cabling to telephone switches or incoming utility CO lines to PBX.

B. UTP Cross-connects will be field installed between 110 IDC terminations blocks provided.

C. UTP Cross-connect wire requirements:

1. Must be same gauge as horizontal / station cabling (typ. #23AWG / #24AWG)
2. Must be Category Rated equal to horizontal / station cabling (CAT-5 minimum)
3. Must be color-coded twisted-pair

a. White-Blue for voice circuits
b. White-Orange for data circuits
c. White-Blue / Green / Orange / Brown (4-pair) for Ethernet cross-connects

4. Constructed with 12-twists per foot (minimum)
5. UL Listed

D. Basis of Design Product:

1. Belden B-Plus Cross-Connect (#22208250 / #22208270)

E. Acceptable Manufacturers:

1. Belden
2. Siemon
3. Equal

2.11 IDC TERMINATIONS BLOCKS

A. IDC Terminations Blocks shall be Category Rated to equal the project horizontal UTP cabling.

B. IDC Terminations Blocks may be wall mount and / or rack mount. Wall mount blocks to be provided complete with backboard standoff legs and Wire Managers.

C. IDC Termination Blocks possess the following features:

1. 110-style IDC terminations
2. 50 / 100 / 200 / 300-pair blocks
3. ANSI / TIA / EIA-606-A compliant labeling means
4. UL Listed

D. Basis of Design Product (wall mount):

1. Leviton GigaMax 5e (#41AW2-300)
2. Ortronics Clarity-6 (#OR-110ABC6xxx)
3. Siemon S110 Connection System (#S110AW2-xxx)

E. Basis of Design Product (panel mount):

1. Leviton GigaMax 5e (#41DR2-300)
2. Ortronics #OR-302003251

F. Acceptable Manufacturers:

1. Ortronics
2. Leviton
3. Siemon
4. Belden
5. Approved Equal

2.12 BACKBOARDS

A. Communications Equipment Rooms (ER), Terminations Closets (TC), Main Computer Rooms (MDF), Intermediate Telecom Closets (ITC), IDF's, CATV Rooms, shall be fully lined with equipment mounting Backboards as defined below.

B. Backboards will be field constructed and must possess the following:

1. Must be constructed of 48"x 96"x ¾" BCX, fire rated plywood.
2. All exposed / visible surfaces coated with a light gray or white fire retardant / low smoke paint.
    a. Low smoke paint is required where standard A/C plywood is used to construct backboards.
    b. Where BCX plywood is used, standard paint is acceptable.
3. Dings, dents, voids, and / or other surface defects shall be filled and sanded smooth.
4. Backboards are to be installed beginning 6" above finished floor (AFF) and extending upwards a full 96" or to the finished ceiling, if one exists.
5. Backboards are to be installed with required voice / data / electrical branch circuit outlet plates mounted flush with supporting backboard.

a. Where backboards are installed over existing junction boxes / service outlets, create a cut-out access hole through backboard with dimensions 1/2” greater than existing device and provide extension boxes / mud-rings to bring the outlet plate flush with backboard surface.
b. Surface mount boxes / raceways shall not be acceptable.

C. Acceptable Manufacturers:

1. Field Installed & Fabricated by Contractor

2.13 TELECOM GROUNDING BAR (TGMB / TGB)

A. NEMA approved Telecom Grounding Bar shall be provided, delivered, and installed per NFPA 70 and ANSI / TIA / EIA-607 requirements to the building grounding system.

B. Provide a #6AWG green insulated wire to bond TGB’s to TGMB and main electrical service grounding electrode system.

C. The Telecom Grounding Bar must be constructed as follows:

1. Predrilled solid copper bus bar with dimensions ¼”x 4”x 20” min. (TGMB)
2. Predrilled solid copper bus bar with dimensions ¼”x 2”x 12” min. (TGB)
3. BICSI & ANSI / EIA / TIA compliant
4. UL Listed (UL467)
5. Provided with standoff insulating bracket kit

D. Basis of Design Product:

1. Chatsworth #40153-020 (TGMB)
2. Chatsworth #13622-012 (TGB)

E. Acceptable Manufacturers:

1. Chatsworth
2. ERICO
3. Approved Equal

2.14 VERTICAL CABLE LADDER RACK

A. Cable Ladder Rack within telecom spaces act as vertical wireways and support for cabling entering and terminating within telecom spaces. Provide, deliver, and install Cable Ladder Rack as reflected in floor plan drawings.

B. Cable Ladder Rack shall be installed as a system which includes (but not limited to) ladder racks, mounting plates, angle support brackets, butt splices, cabling roll-out supports, grounding straps, connection junctions, and support hardware.

C. Cable Ladder Rack shall be constructed as follows:

1. Rectangular side bars (stringers) nominally 3/8”x 1-1/2”
2. Horizontal support rungs nominally 3/8”x 1-1/2”
3. Horizontal supports welded to side bars at 12” on-center (maximum) for tray widths greater than 12” Horizontal rung supports welded to side bars at 4” to 8” on-center (maximum) for tray widths equal to or less than 12”.
4. Available in the following standard widths:

    a. 9”
    b. 12”
    c. 15”
    d. 18”
    e. 24”

5. Baked on powder-coat finished

D. Provide and install with manufacturer approved, NEC Article 250 & 392 compliant, grounding and bonding system.

E. Basis of Design Product:

1. Chatsworth Universal Cable Runway.

F. Acceptable Manufacturers:

1. Chatsworth
2. Cablofil / Legrand
3. Cooper B-Line
4. Approved Equal

2.15 HORIZONTAL CABLE TRAY

A. Horizontal Cable Tray within telecom spaces act as horizontal wireways and support for cabling entering and terminating within telecom spaces. Provide, deliver, and install Cable Tray as reflected in floor plan drawings.

B. Horizontal Cable Tray shall be installed as a system which includes (but not limited to) trays, mounting plates, angle support brackets, butt splices, radiused cabling exit roll-out supports, grounding straps, connection junctions, and support hardware.

C. Horizontal Cable Tray shall be constructed as follows:

1. Welded pre-galvanized, welded wire basket assembly
2. Rib wire 5mm (0.197”) minimum / or shaped wire construction
3. Available in baked on powder-coat finishes
4. Available in the following standard widths:

    a. 12”
    b. 16”
    c. 18”

d. 20”
e. 24”

D. Horizontal Cable Tray rung spacing shall be 12” or less for tray widths greater than 12”. Rung spacing shall be 8” or less for tray widths equal to or less than 12”.

1. Baked on powder-coat finished

E. Provide Horizontal Cable Tray with radiused cable exit roll-out supports where cabling transitions downward for termination. The roll-out support radius must equal or exceed the cable manufacturers minimum cabling bend radius.

F. Provide and install with manufacturer approved, NEC Article 250 & 392 compliant, grounding and bonding system.

G. Basis of Design Product:

1. WBT Shaped Crosswire Cable Tray
2. Chatsworth Universal Cable Runway

H. Acceptable Manufacturers:

1. WBT
2. Chatsworth
3. Cablofil / Legrand
4. Cooper B-Line
5. Submit alternates for review and approval
6. Approved Equal

2.16 FIRE RATED PATHWAY (FIRE STOP PENETRATION ASSEMBLY)

A. Fire Rated Pathways are UL Certified enclosed fire rated cabling pathways providing code compliant penetrations through rated walls and / or floors.

B. Fire Rated Pathways contained engineered fire sealing systems sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed and / or retrofitted without the need to remove or reinstall the firestopping materials.

C. Fire Rated Pathways are tested to be compliant with the following:
1. ASTM E814
2. UL 1479

D. Basis of Design Product:

1. EZ-Path 44+

E. Acceptable Manufacturers:

1. Submit alternates for review and approval.

PART 3 - EXECUTION

3.01 GENERAL CONDITIONS

A. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

B. Comply with BICSI TDDM for layout and installation of Communications Equipment Rooms & Fittings.

C. Bundle, lace and train conductors and cables to termination points without exceeding manufacturer’s limitations on bend radii. Provide lacing bars, distribution spools, and D-rings as applicable.

D. Coordinate layout and installation of communications equipment with Owner’s telecom and LAN equipment provider / manager. Coordinate service entrance with CLEC.

3.02 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to cabling installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems.

C. Alert the Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Correct any unsatisfactory conditions before proceeding with work.

3.03 WIRING INSTALLATION

A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12' AFF. Cabling may be installed free run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12' AFF.

E. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

F. **Cabling entering enclosures**: Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

G. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

H. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48" cabling pre-termination loop at field devices (free run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18" cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.
3. Equipment Racks: Provide a minimum 96" cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120" cabling pre-termination loop at cabling wall field locations

I. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36" post-termination cabling service loop at field devices (free run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12" post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48" post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.

4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations

J. Cable Identification: Each wire and / or cable installed must be permanently identified with legibly printed, unique cabling identification label. Cable Labeling must conform with the following:

1. Cabling Identification label must be mechanically printed. Handwritten cabling identification labels are not acceptable except for temporary identification during installation. Handwritten labels must be replaced with mechanically printed labels.
2. Cabling Identification labels must be affixed to each cable within 16” of termination.
3. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to and cable type.

K. Grounding: Take all necessary precautions to minimize electromagnetic and / or electrostatic interference. Grounding bars in equipment racks must be bonded to grounding bars in equipment rooms, IDF, and / or building ground system. Comply with NEC Article 250.

3.04 FLOOR STANDING RACKS

A. Securely mount all floor standing racks to the floor. Provide all anchors / bracing required by seismic zone requirements. In seismically active areas, provide the following:

1. Zone 2B

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.
b. Provide rear support for mounted equipment weighing in excess of 10 lbs. / RU, or where the equipment depth exceeds 3.0 times its height (in RU’s).

2. Zone 3 or greater

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.
b. Provide rear support for mounted equipment weighing in excess of 5 lbs. / RU, or where the equipment depth exceeds 2.5 times its height (in RU’s).
c. Provide additional bracing to side walls. Side wall bracing to be installed at the top of each installed rack.

3. Adhere to all other local seismic / life safety code requirements

B. Install floor standing equipment racks with a minimum of 36” clear access behind and in front of rack assemblies. Notify Architect / Engineer in writing if clearances cannot be obtained.

C. Racks specified for installation in non-dedicated telecom rooms (spaces with general employee / public access) shall be provided fully as enclosed and locking. Provide with side panels, locking doors. Assure proper ventilation for any active electronics installed within. Deliver six (6) sets of keys to Owner. Provide all locking racks as keyed-alike.

D. Floor Standing Racks are the preferred mounting method for telecom terminations spaces 60 square feet or larger. Utilize Wall Mounted Racks for telecom spaces less than 60 square feet.

E. Provide all vertical and / or horizontal cable managers shown in drawings. Securely assemble and install per manufacturer’s requirements. Fully bond all metallic assemblies together.

F. Coordinate the installation of other Equipment Room Fittings such as patch panels, lightguide interface units (LIU’s), cable management assemblies, and active network devices with rack elevations and / or Owners IT department. Where otherwise not indicated, populate rack starting at the top and working downward.

G. Touch-up paint any minor scratches, dings, or rubs created during installation.

H. Ground and bond Cable Management Racks as required by NFPA 70, Article 250.

3.05 WALL MOUNTED RACKS

A. Securely mount wall mount racks to building structure / backboards with approved, rated fasteners. Verify existing wall conditions and structural integrity before installation.

B. Install wall mount racks with a minimum of 36” clear access front of rack assemblies. Allow a minimum of 24” on the hinged side of swinging wall mount racks. Notify Architect / Engineer in writing if clearances cannot be obtained.

C. Racks specified for installation in non-dedicated telecom rooms (spaces with general employee / public access) shall be provided fully as enclosed and locking. Provide with side panels, locking doors. Assure proper ventilation for any active electronics installed within. Deliver six (6) sets of keys to Owner. Provide all locking racks as keyed-alike.

D. Wall Mounted Racks are the preferred mounting method for telecom terminations spaces less than 60 square feet. Utilize Floor Mounted Racks for telecom spaces 60 square feet or greater.

E. Provide all vertical and / or horizontal cable managers shown in drawings. Securely assemble and install per manufacturer's requirements. Fully bond all metallic assemblies together.

F. Coordinate the installation of other Equipment Room Fittings such as patch panels, lightguide interface units (LIU's), cable management assemblies, and active network devices with rack elevations and / or Owners IT department. Where otherwise not indicated, populate rack starting at the top and working downward.

G. Ground and bond Wall Mounted Racks as required by NFPA 70, Article 250

3.06 VERTICAL CABLE MANAGERS

A. Provide Vertical Cable Manager complete with hinged front cover.

B. Install Cable Management Racks with sufficient inter-rack space to accommodate Vertical Cable Managers. Follow manufacturer recommendations installing products.

3.07 CABLE TRAY / LADDER RACK

A. Install Cable Tray level, plumb and attached securely from structure according to manufacturer's requirements. Provide continuous grounding wire along length.

B. Install expansion connectors where Cable Tray crosses building expansion joints. Make directional and elevation changes using standard manufactured fittings.

C. Seal any penetrations through fire rated walls and / or smoke barriers with manufactured firestopping products. Install capped sleeves for future cables through firestop sealed cable tray penetrations.

D. Cable Tray to be installed +90" AFF. Properly secure to top of distribution frame racks where required.

E. Ground and bond Cable Tray assembly as required by NFPA 70, Article 250 and Article 392.

F. Provide all anchors / bracing required by seismic zone requirements.

3.08 UTP (RJ-45) PATCH PANELS

A. Provide and install sufficient quantity UTP Patch Panels to fully terminate all Horizontal UTP cabling installed within the facility, including 20% spare capacity for future expansion.

B. Provide required cable management for both rear terminated UTP cabling and front patch cables.

C. Fully label each terminated port and cable on all patch panels using machine printed labeling strips. Comply with ANSI / EIA / TIA-606A and UL 969 labeling requirements.

D. Terminate UTP cabling per manufacturers requirements. Use manufacturer's recommended terminations tool.

E. Limit UTP pair untwisting to ½" or less at point of termination.

3.09 UTP CROSS-CONNECT

A. Unless otherwise noted, UTP Cross-connects are scheduled to be part of this scope of work.

B. Coordinate with Owner for a schedule of Cross-connects to be provided.

C. Terminate UTP cabling per manufacturers requirements. Use manufacturer's recommended terminations tool.

D. Limit UTP pair untwisting to ½" or less at point of termination.

3.10 IDC TERMINATIONS BLOCKS

A. IDC Terminations Blocks to be securely mounted to Backboards within wall space identified as "voice wall field" or similar. IDC Terminations Blocks to be affixed to backboard plywood using wood or sheet metal screws, #8 diameter or greater. Length of mounting screw not to exceed 1".

B. Terminate conductors to IDC Terminations Block using 110-style terminations tool recommended by manufacturer. Fully terminate all pairs of UTP cabling.

C. Terminate UTP cabling per manufacturers requirements. Use manufacturer's recommended terminations tool.

D. Limit UTP pair untwisting to ½" or less at point of termination.

3.11 BACKBOARDS

A. Wall space specified in drawings as requiring backboards must be lined completely with indicated product, appropriately painted. Backboard panels must be installed vertically and contiguous with no inter-panel gaps. Install backboards filled, sanded smooth, and painted with fire-retardant, low smoke paint (to match wall color).

B. Backboard plywood must be securely mounted to structure or to 2 x 4 standoffs as indicated in drawings. Installed backboard must be capable of supporting 1,500 lbs. of equipment, cabling and terminations, per panel. Heads of screws mounting backboard to structure must be installed flush to surface of backboard.

C. Install bottom edge of plywood panel beginning +12" AFF. Install full height panels (96"). Where floor to slab heights are less than 108", backboard may be installed lower than 12" AFF.

D. Install all required branch circuit power outlets, voice / data receptacles, and / or other required surface mounted devices within the outline / footprint of the backboards flush with backboard surface. Recess mount all required mounting boxes, raceways, junction boxes, and / or cables necessary to support said devices. No surface mount backboxes and / or raceways permitted.

E. Provide sufficient cable spools, D-rings, cable managers, to fully support cable as it transitions across backboards. All cabling must be neatly installed. Minimize horizontal cable runs across backboards. Where cabling must be run horizontal, transition across top or bottom of backboards.

F. Group cables by terminations. Horizontal cabling grouped and bundled separately from CO lines, etc.

3.12 TELECOM GROUNDING BAR (TGMB / TGB)

A. NEMA approved Telecom Grounding Bar to be provided, delivered, and installed per NFPA 70 Article 250 and according to BICSI TDDM – "Grounding, Bonding and Electrical Protection" Chapter to the building grounding system and steel

B. Install TGMB / TGB securely mounted to Backboard and within close proximity to Cable Tray within ER / MDF / TC / ITC. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar.

C. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

D. Terminals attaching grounding cables to TGMB / TGB must be solderless, compression type. Attach terminals to TGMB / TGB using silicon bronze / brass threaded fasteners.

3.13 RACK ASSEMBLY

A. The Contractor shall provide necessary miscellaneous components necessary to make a complete and functional equipment rack installation.

1. Top and sides shall be fitted with appropriate panels to wholly enclose equipment and cabling. Rear panels shall be provided if equipment rack is not mounted against a wall.
2. Unoccupied front rack spaces shall be completely filled with blank / vent panels.
3. Locking doors and / or panels shall be keyed-alike. Six (6) duplicate sets of keys shall be delivered with closeout documents at Owner acceptance.

B. Equipment racks not installed against walls shall have branch circuit power brought in through the floor or from overhead as indicated in the Construction Documents.

3.14 COORDINATION

A. Contractor shall provide information, instruction, and manufacturer specific / specialty back boxes and / or other custom raceway material(s) to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 - Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

END OF SECTION

SECTION 27 1513 – COMMUNICATIONS COPPER CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. This Section, along with related Drawings and Specification Sections, shall define the requirements for Voice, Data, and other Technology Systems backbone, riser, and horizontal distribution Communications Copper Cabling. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Copper Cabling system.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional integration requirements.

D. Special coordination with the following Sections is required. Submit the following sections together per Section 27 0500-1.5-C:

1. Section 27 1100 (Communications Equipment Room Fittings)
2. Section 27 1523 (Communications Optical Fiber Cabling)
3. Section 27 1533 (Communications Coaxial Cabling)

1.2 SUMMARY

A. It is the intent of This Section and related Sections to define and require a complete, Manufacturer Certified and Warranted Communications Structured Cabling system.

B. Communications Copper Cabling comprise a part of the physical layer / Communications Structured Cabling system for all Voice, Data Network, Audio / Video, Television Signal Distribution, Security, Surveillance, Access Control, Intercom, and other allied Technology Systems being implemented for this projects scope of work.

C. A complete Certified and Warranted Communications Structured Cabling system consists of backbone cabling, riser cabling, horizontal cabling, faceplates, category rated outlet jacks, customer-owned outside plant cabling (CO-OSP), patch / terminations panels, termination / equipment racks, backboards, cross-connects, mechanical terminations, patch cords or jumpers, wall / ceiling / floor mounted termination jacks & plates, and cabling identification system is required.

D. Other Communications Structured Cabling system components include materials and installation practices listed in Section 27 1100 (Communications Equipment Room Fittings).

E. Communications Copper Cabling shall be provided and installed with specific ratings listed in floorplan, riser, backbone, and campus distribution diagrams. Where they differ, Cabling ratings required by Authority Having Jurisdiction (AHJ) supersede those found in the Contract Documents.

F. Communications Copper Cabling may be additionally referred to in the Contract Documents with the any of following terms:

1. Unshielded Twisted Pair (UTP) cabling
2. Shielded Twisted Pair (STP) cabling
3. Screened Twisted Pair (ScTP) cabling
4. Category Rated cabling
5. CAT-3 / 5e / 6 cabling
6. Backbone cabling (copper)
7. Riser cabling (copper)
8. Horizontal cabling (copper)
9. Plenum cabling (copper)
10. 100Ω UTP cabling
11. Cross-connect cabling

G. Horizontal Cabling (Copper)

1. Horizontal Cabling provides interconnection between communication termination closets (ITC / IDF's) and remote communications jack outlet plates in the Communications Structured Cabling system.
2. Horizontal Cabling shall be installed complete and unspliced between the communications jack outlet plate and the terminations panel located in the IDF / ITC (unless specifically noted and detailed).
3. Maximum allowable length for Horizontal Cabling is 295 feet (TC termination to jack outlet plate termination).
4. Horizontal Cabling intended for use in Voice / Analog circuits are to be terminated on CAT-6 rated 110-style IDC blocks in the IDF / MDF.
5. Horizontal Cabling intended for use in VoIP circuits are to be terminated on CAT-6 rated RJ-45 jacks in patch panels in the IDF / MDF.
6. Horizontal Cabling intended for use in Data / Network circuits are to be terminated on CAT-6 rated RJ-45 jacks in patch panels in the IDF / MDF.
7. Differentiate each Horizontal UTP Cable by system / use / signal type by providing each type with a unique cable jacket color. Examples:

    a. Data / WAP = green jacketed cable
    b. Voice / Analog = yellow jacketed cable
    c. Security / IP-CCTV = blue jacketed cable
    d. AV / IPTV = white jacketed cable
    e. Fire Protection = red jacketed cable
    f. Submit intended jacket colors for approval if different from above.

H. The installation of the Communications Copper Cabling shall be coordinated and integrated with Optical Fiber, Coaxial Cabling, and other related Technology

Systems listed in Specification Section 27 0500 Part 1.1-D (Technology Systems – General Conditions).

I. Communications Copper Cabling installed through and / or terminated in outdoor / exterior locations must be gel filled / wet location rated cabling. If Communications Copper Cabling extends beyond 50 feet outside the foundation of the structure, surge suppression / TVSS protection must be provided within 15 feet of cable entrance into the building. Reference NEC 725.3 (L) for complete code requirements.

J. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Copper Cabling system. Include any miscellaneous materials, parts, terminations, and / or supplies necessary for proper operation, but not specifically mentioned. Provide all labor, materials, and supervision to test, adjust, and calibrate the system to ANSI / TIA / EIA / BICSI standards.

K. Manufacturers Cable Certification for all UTP Copper cables installed is a required submittal item for project completion and closeout.

1.3 DEFINITIONS

A. Following is a listing of system specific abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1.	BICSI	Building Industry Consulting Service International
2.	IDC	Insulation Displacement Connector
3.	IDF	Intermediate Distribution Frame
4.	IP	Internet protocol.
5.	ITC	Intermediate Terminations Closet
6.	LAN	Local area network
7.	MDF	Main Distribution Frame
8.	MPOE	Main Point of Entry (communications demarcation location)
9.	POTS	Plain Old Telephone Service (Analog Voice)
10.	RCDD	Registered Communications Distribution Designer
11.	TC	Terminations / Telecommunications Closet
12.	UON	Unless Otherwise Noted
13.	UPS	Uninterruptible power supply
14.	UTP	Unshielded Twisted Pair
15.	WAN	Wide area network.

B. Reference Specification Section 27 0500-1.3 for a more comprehensive listing of Contract Document definitions.

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals shall be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options shall be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor shall clearly indicate which model / type is being provided for each application.

C. Shop Drawings: Include plans, elevations, sections, details, and details on integration with other work.

1. Detail equipment assemblies and indicate dimensions, weights, options, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types, signal levels, and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. Cable Labeling plan reflecting cable identification scheme to be mechanically imprinted upon cable labels. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to, cable type, and results of testing in the closeout documents
5. UPS: Sizing calculations.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

E. Statement of Manufacturer's Warrantee for completed Structured Cabling System: Statement must include length of warrantee and performance level warranted.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals shall be made in

compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

1.7 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where “Approved Equal” is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following:

1. BICSI Telecommunications Distribution Design Manual (TDDM)
2. BICSI Customer Owned Outside Plant Design Manual (CO-OSP)
3. Americans with Disabilities Act (ADA)
4. ANSI / TIA / EIA-568-B: Commercial Building Telecommunications Cabling Standard
5. ANSI / TIA / EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
6. ANSI / TIA / EIA -606-A/B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
7. ANSI / TIA / EIA -607: Commercial Building Grounding and Bonding Requirements for Telecommunications
8. NFPA 70 (latest edition adopted by AHJ)
9. NEMA 250
10. ANSI / NECA / BICSI 568 Standard for Installing Commercial Building Telecommunications Cabling

C. Technology Systems Installers tendering proposals for work defined in this and related sections, must meet the qualifications listed in Specification Section 27 0500-1.9 (Technology Systems – General Conditions).

1.8 WARRANTIES AND REMEDIATION

A. General Warranty: The Contractor must warrant the Communications Copper Cabling against defects in installation and workmanship, including labor and parts, for a period of not less than **one year** from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Manufacturer’s Warranty: Manufacturer's standard certification and warranty in which manufacturer agrees to repair or replace components and / or equipment

that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: **Ten Years** from date of system Final Acceptance.

C. Reference Specification Section 27 0500-1.8 (Technology Systems - General Conditions) for additional warranty and remediation requirements.

1.9 COORDINATION

A. Contractor must supply and deliver all manufacturer specific / specialty back boxes, installation instructions, information, and / or other custom raceway material(s) for technology systems devices to be installed to raceway installer prior to the commencement of his work. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. General Performance: Horizontal UTP Voice / Data cabling system shall comply with transmission standards in TIA / EIA-568-B.1 and shall be tested according to test procedures of this standard.

B. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

C. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification Section 27 0500 (Technology Systems – General Conditions).

D. Products and / or Equipment connected to the electrical system (branch circuit power) shall be provided with the same ratings as the local utility (both voltage and frequency).

E. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors / ratings, provide all required items from a single manufacturer (i.e.: provide all UTP cabling from a single manufacturer, UON).
3. Where the Contract Document require materials or devices designed to be mounted within or sub-assemblies of another product, provide all required items from a single manufacturer.

F. Not every product listed in Part 2 may be required to satisfy the project design intent. Reference floorplan drawings, one-line diagrams, schedules, details, and specifications for the complete design intent.

G. Products and / or Equipment required by the AHJ to be UL listed shall bear the UL logo.

H. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

I. Substitution Requests:

1. Substitution requests must be accompanied with a written statement of benefit or savings realized.
2. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment.
3. Manufacturer’s cut sheets for proposed substitutions must accompany each request.
4. Where substitutions alter the space requirements of equipment locations reflected in the Contract Documents, the Contractor is required to submit revised drawings indicating proposed layout of equipment.

2.2 HORIZONTAL CATEGORY RATED UTP CABLE (CAT-6 / 6A)

A. Horizontal Category Rated UTP Cabling shall be 4-pair, #23 / 24AWG, unshielded, twisted-pair, solid copper conductor, UTP construction specifically designed, manufactured, tested, and UL Listed, warranted for use in Ethernet based, enterprise class, data networks.

B. Description: 100-ohm, four-pair UTP with a thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA / EIA-568-B.1 for performance specifications.
3. Comply with ANSI / TIA-568-C.2, Category 6 / 6A.
4. Listed and acceptable to Authorities Having Jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. General Purpose: Type CM / CMG / CL3 / CL2
b. Riser Rated: Type CMR / CL3R / CL2R, complying with UL 1666.
c. Plenum Rated: Type CMP / CL3P / CL2P, complying with NFPA 262.
d. Residential type, CMX, or unrated cabling not permitted.

C. Provide Horizontal Category Rated UTP Cabling tested, UL listed, and with category ratings reflected in drawings. Differentiate each Horizontal Category Rated UTP Cable by system / use / signal type by providing each type with a unique cable jacket color. Examples:

a. Data = green jacketed cable
b. Voice / Analog = yellow jacketed cable
c. CCTV = blue jacketed cable

A. Horizontal Copper Cabling for exterior use shall possess the following characteristics:

1. Four-pair construction
2. Gel Filled – exterior rated
3. High density polyethylene jacketed (with corrugated metallic shield / armor where noted)
4. Color coded pairs per TIA / EIA-568-B standards.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Belden Inc.
2. CommScope, Inc.
3. West-Penn Wire
4. CSI Technologies Inc.
5. General Cable Technologies Corporation.
6. Superior Essex Inc.
7. 3M Communication
8. Approved Equal

2.3 TELECOMMUNICATIONS OUTLET JACKS (RJ-45)

A. Telecommunications Outlet Jacks are used to terminate Communications Horizontal Copper Cabling at field / edge device / workstation locations.

B. Telecommunications Outlet Jacks are modular RJ-45 jacks, 100-ohm, balanced, twisted-pair IDC connector; four-pair, eight-conductor construction. Comply with ANSI / TIA-568-C.2.

C. Must be available in multiple colors for identification. Jacks designed to snap into matching, user configurable faceplates.

D. Must be Category Rated to match terminated cabling (CAT-6).

E. Shall be terminated per TIA-568B standards.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Leviton Inc.
2. Hubbell, Inc.
3. Alcatel-Lucent
4. Thomas & Betts
5. Panduit Corp.
6. Approved Equal

2.4 TELECOMMUNICATIONS FACEPLATES

A. Telecommunications Faceplates are used to hold and mount Telecommunications Outlet Jacks onto wall-mount junction boxes at field / edge device / workstation locations.

B. Telecommunications Faceplates shall be constructed of impact resistant nylon, stainless-steel, or brass, per Architect / Interior Design requirements.

C. Telecommunications Faceplates provided shall be color matched to Architect / Interior Design requirements.

D. Single-gang Telecommunications Faceplates shall accommodate up to six (6) modular Outlet Jacks. Double-gang Telecommunications Faceplates shall accommodate up to twelve (12) modular Outlet Jacks. Reference drawings for location specific Faceplate and Outlet Jack requirements.

E. Telecommunications Faceplates shall accommodate printed, snap in labeling identification strips.

F. Telecommunications Faceplates shall be UL listed for use / location.

G. Label jacks in Faceplates per ANSI / TIA / EIA-606-A/B.

2.5 WALL PHONE MOUNTING PLATE / JACK ASSEMBLY

A. Wall Phone Mounting Plates are designed to accommodate one RJ-11 / 12 / 45 jack for the termination, connection, and physical mounting of a wall-mount telephone / telephone appliance.

B. Wall Phone Mounting Plates shall be constructed of stainless-steel and will contain metal mounting lugs designed to mate with industry standard wall-mount telephone base plate or adapters (varies by country).

C. Wall Phone Mounting Plates shall be single-gang construction and must be installed at ADA required heights.

2.6 CATEGORY RATED PATCH CABLES (CAT-6)

A. Category Rated Patch Cables are four-pair (eight-conductor) modular plug to modular plug (RJ-45) preassembled cables intended to cross-connect horizontal cabling patch panel jacks to active network switches.

B. Category Rated Patch Cables shall be tested and rated to match the rating of horizontal cabling and patch panels.

C. Category Rated Patch Cables shall be fabricated with snag-less design male RJ-45 plugs rated to match horizontal cabling.

D. Provide sufficient quantity and lengths to fully cross-connect terminated patch panel ports to active network switches.

2.7 CATEGORY RATED WORKSTATION CABLES (CAT-6)

A. Category Rated Workstation Cables are four-pair (eight-conductor) modular plug to modular plug (RJ-45) preassembled cables intended to connect horizontal cabling patch panel jacks to workstation PC's.

B. Category Rated Workstation Cables shall be tested and rated to match the rating of horizontal cabling and patch panels.

C. Category Rated Workstation Cables shall be fabricated with snag-less design male RJ-45 plugs rated to match horizontal cabling.

D. Provide sufficient quantity and length workstation cables to fully connect all delivered workstation PC to horizontal network cabling outlet plates. Minimum workstation cable length shall be four feet (4').

2.8 COMMUNICATIONS COPPER CABLING HARDWARE

A. Reference Specification Section 27 1100 (Communications Equipment Room Fittings) for additional UTP Cable terminations hardware requirements.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Backbone & Horizontal UTP Voice / Data cabling system shall comply with transmission standards in ANSI / TIA-568-B.1 and shall be tested according to test procedures of this standard.

B. Coordinate backbone cabling with station protectors and demarcation point provided by the Communications Service Provider.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

3.2 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, “Good Workmanship in Electrical Construction” for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12’ AFF. Cabling may be installed free-run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12’ AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

L. Install plenum rated cable in environmental air spaces, including ceiling plenums.

M. UTP Cabling

1. CMR / CL2 / CL2R rated UTP Cabling installed concealed in walls, below raised floors, in soffits, or above inaccessible ceiling spaces shall be installed within metallic conduits (EMT). Provide plenum rated (CMP / CL2P) rated UTP cabling if free-run within these spaces.
2. UTP cabling installed above accessible ceilings may be installed free-run via cable supports / j-hooks attached to building structure in lieu of raceways. Provide plenum rated (CMP / CL2P) where required by AHJ or local building codes.
3. Install cabling in neat and workmanlike manner. Neatly bundle and Velcro strap cables into workmanlike bundles. Plastic tie-wraps are permissible only where Velcro straps will not support the cable bundle.
4. Maintain EIA / TIA / BICSI recommended cable bend radius for each cable type installed. Do not untwist cable pairs more than 0.5 in. when terminating. Install all cabling using EIA / TIA / BICSI best practices.
5. Fully terminate all conductors; no cable shall contain un-terminated conductors. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. UTP Cables may not be spliced.
7. Install cable without damaging conductors, shield, or jacket.
8. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.
9. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

a. Pull cables simultaneously if more than one is being installed in the same raceway.
b. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
c. Use pulling means including fish tape, cable, rope, and basket-weave wire / cable grips that will not damage media or raceway.

10. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and / or terminals.
11. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
12. Install per NEC and Life Safety requirements.
13. Maintain proper clearances from EMI / RF noise sources.
14. Replace any cable exhibiting physical defects such as cuts, tears, kinks, or bulges.
15. Label each cable installed per ANSI / TIA / EIA-606-A/B requirements.
16. Firestop all openings where cabling is installed through a rated wall.

N. Outlet Jacks & Faceplates

1. Install Faceplates flush and square to mounting surface / outlet box.
2. Telecommunications Outlet boxes shall be secured to building with mechanical fasteners.
3. Modular Outlet Jacks shall be installed into matching Faceplates. Provide blank inserts for all empty / unused jack openings.

O. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48” cabling pre-termination loop at field devices (free-run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18” cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.
3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

P. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free-run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.

Q. Cable Identification: Each wire and / or cable installed must be permanently identified with legibly printed, unique cabling identification label. Cable Labeling must conform with the following:

1. Cabling Identification label must be mechanically printed. Handwritten cabling identification labels are not acceptable except for temporary identification during installation. Handwritten labels must be replaced with mechanically printed labels.
2. Cabling Identification labels must be affixed to each cable within 16” of termination.
3. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to and cable type.

R. Grounding: Take all necessary precautions to minimize electromagnetic and / or electrostatic interference. Grounding bars in equipment racks must be bonded to grounding bars in equipment rooms, IDF, and / or building ground system. Comply with NEC Article 250.

3.3 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to cabling installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Verify all required LAN / WAN data network elements required for the proper operation are in place and functional. Coordinate installation with facility network administrator.

D. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the

work. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for additional project Execution requirements.

3.4 COORDINATION

A. Contractor shall provide information, instruction, and manufacturer specific / specialty back boxes and / or other custom raceway material(s) to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Coordinate the layout and installation of Communications Copper Cabling with other telecommunications and LAN / WAN equipment and service providers.

C. Coordinate the installation of each voice / data / television communications outlet plate location within 12” of a branch circuit power outlet. Notify Architect / Engineer if branch circuit power is not specified by electrical documents at any communications outlet location.

D. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

3.5 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with ANSI / TIA / EIA-606-A/B Cable Labeling Standards. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with ANSI / TIA / EIA-606-A/B for Class 2 level of administration.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of ANSI / TIA / EIA-606-A/B. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in ANSI / TIA / EIA-606-A/B.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with ANSI / TIA-568-B.1.
2. Visually confirm Category marking of UTP cabling, outlet jacks, patch cables, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Backbone / Riser UTP Performance Tests:

    a. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test

operation of shorting bars in connection blocks. Test cables after termination but before cross-connection.

b. Test instruments shall meet or exceed applicable requirements in ANSI / TIA-568-B.1.

5. Horizontal UTP Performance Tests:

a. Test each cable using a certified and calibrated DSP based 100 / 1000BaseT Network Cable Scanner / Analyzer. The Network Cable Scanner / Analyzer shall be capable of certifying and qualifying Category 6a cable performance to 650 MHz. Perform both Time and Frequency Domain testing.

b. Test for each outlet and MUTOA. Perform the following tests according to ANSI / TIA-568-B.1 and ANSI / TIA-568-C.2:

1) Wire map (faults, split pairs, pair reversals)
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss
4) Near-end crosstalk (NEXT) loss
5) Power sum near-end crosstalk (PSNEXT) loss
6) Equal-level far-end crosstalk (ELFEXT)
7) Power sum equal-level far-end crosstalk (PSELFEXT)
8) Direct Current Loop Resistance
9) Return loss
10) Propagation delay
11) Delay skew

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet / connectors are installed.

a. Voice Tests: Tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
b. Data Tests: Tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Results of testing and remediation work shall be Manufacturer's Certification and Warranty.

END OF SECTION

SECTION 27 1523 – COMMUNICATIONS OPTICAL FIBER CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. This Section, along with related Drawings and Specification Sections, shall define the requirements for Voice, Data, and other Technology Systems backbone, riser, and Communications Optical Fiber Cabling. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Optical Fiber Cabling system.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional integration requirements.

D. Special coordination with the following Sections is required. Submit the following sections together per Section 27 0500-1.5-C:

1. Section 27 1100 (Communications Equipment Room Fittings)
2. Section 27 1513 (Communications Copper Cabling)
3. Section 27 1533 (Communications Coaxial Cabling)

1.2 SUMMARY

A. It is the intent of This Section and related Sections to define and require a complete, Manufacturer Certified and Warranted Communications Structured Cabling system.

B. Communications Optical Fiber Cabling comprise a part of the physical layer / Communications Structured Cabling system for all Voice, Data Network, Audio / Video, Television Signal Distribution, Security, Surveillance, Access Control, Intercom, and other allied Technology Systems being implemented for this projects scope of work.

C. A complete Communications Structured Cabling system consists of backbone cabling, riser cabling, customer-owned outside plant cabling (CO-OSP), patch / terminations panels, termination / equipment racks, backboards, cross-connects, mechanical terminations, patch cords or jumpers, wall / ceiling / floor mounted termination jacks & plates, and cabling identification system.

D. Other Communications Structured Cabling system components include materials and installation practices listed in Specification Section 27 1100 (Communications Equipment Room Fittings).

E. Communications Optical Fiber Cabling shall be provided and installed with specific ratings listed in floorplan, riser, backbone, and campus distribution diagrams. Where they differ, Cabling ratings required by Authority Having Jurisdiction (AHJ) supersede those found in the Contract Documents.

F. Communications Optical Fiber Cabling may be additionally referred to in the Contract Documents with the any of following terms:

1. 50 / 125µm, OM3 / OM4 rated multi-mode optical fiber cabling
2. 8.9 / 125µm, OS2 rated single-mode optical fiber cabling

G. Backbone / Riser Cabling (Optical Fiber)

1. Backbone / Riser Optical Fiber Cabling provides interconnection between communication termination closets (ITC / IDF's), main server / equipment rooms (MDF, A/V Equipment Rooms), building-to-building campus distribution spaces, and communication provider demarcation locations (MPOE) in the Communications Structured Cabling system.
2. Backbone / Riser Optical Fiber Cabling identified for use in data / network circuits shall be OM3 / OM4 / OS2 multi-strand multi / single-mode optical fiber as identified in the Riser / Cabling Distribution drawings. Data / Network backbone / riser optical fiber cabling shall be terminated on multi / single-mode lightguide patch panels both ends.
3. All communications Optical Fiber Cabling designated as backbone / riser cabling (installed between the main IT equipment room / MDF and remote IT terminations closets / IDF's must be provided within an armored cable assembly.

H. Communications Optical Fiber Cabling installed through and / or terminated in outdoor / exterior locations must be gel filled / wet location rated cabling. Reference NEC Article 840 for complete code requirements.

I. The installation of the Communications Optical Fiber Cabling shall be coordinated and integrated with Copper Cabling, Coaxial Cabling, and other related Technology Systems listed in Specification Section 27 0500 Part 1.1-D (Technology Systems – General Conditions).

J. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Optical Fiber Cabling system. Include any miscellaneous materials, parts, terminations, and / or supplies necessary for proper operation, but not specifically mentioned. Provide all labor, materials, and supervision to test, adjust, and calibrate the system to ANSI / TIA / EIA / BICSI standards.

1.3 DEFINITIONS

A. Following is a listing of system specific abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be

comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1.	BICSI	Building Industry Consulting Service International
2.	IDC	Insulation Displacement Connector
3.	IDF	Intermediate Distribution Frame
4.	IP	Internet protocol.
5.	ITC	Intermediate Terminations Closet
6.	LAN	Local area network
7.	MDF	Main Distribution Frame
8.	MPOE	Main Point of Entry (communications demarcation location)
9.	POTS	Plain Old Telephone Service (Analog Voice)
10.	RCDD	Registered Communications Distribution Designer
11.	TC	Terminations / Telecommunications Closet
12.	UON	Unless Otherwise Noted
13.	UPS	Uninterruptible power supply
14.	UTP	Unshielded Twisted Pair
15.	WAN	Wide area network.

B. Reference Specification Section 27 0500-1.3 for a more comprehensive listing of Contract Document definitions.

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals shall be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options shall be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor shall clearly indicate which model / type is being provided for each application.

C. Shop Drawings: Include plans, elevations, sections, details, and details on integration with other work.

1. Detail equipment assemblies and indicate dimensions, weights, options, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types, signal levels, and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

E. Statement of Manufacturer's Warrantee for completed Structured Cabling System. Statement must include length of warrantee and performance level warranted.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals shall be made in compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

1.7 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where "Approved Equal" is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following:

1. BICSI Telecommunications Distribution Design Manual (TDDM)
2. BICSI Customer Owned Outside Plant Design Manual (CO-OSP)
3. Americans with Disabilities Act (ADA)
4. ANSI / TIA / EIA-568-B: Commercial Building Telecommunications Cabling Standard
5. ANSI / TIA / EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
6. EIA / TIA-606-A/B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
7. EIA / TIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
8. NFPA 70 (latest edition adopted by AHJ)

9. NEMA 250
10. ANSI / NECA / BICSI 568: Standard for Installing Commercial Building Telecommunications Cabling

C. Technology Systems Installers tendering proposals for work defined in this and related sections, must meet the qualifications listed in Specification Section 27 0500-1.9 (Technology Systems – General Conditions).

1.8 WARRANTIES AND REMEDIATION

A. General Warranty: The Contractor must warrant the Communications Optical Fiber Cabling against defects in installation and workmanship, including labor and parts, for a period of not less than **two years** from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Manufacturer's Warranty: Manufacturer's standard certification and warranty in which manufacturer agrees to repair or replace components and / or equipment that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: **Ten Years** from date of system Final Acceptance.

C. Reference Specification Section 27 0500-1.8 (Technology Systems - General Conditions) for additional warranty and remediation requirements.

1.9 COORDINATION

A. Contractor must supply and deliver all manufacturer specific / specialty back boxes, installation instructions, information, and / or other custom raceway material(s) for technology systems devices to be installed to raceway installer prior to the commencement of his work. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification Section 27 0500 (Technology Systems – General Conditions).

C. Products and / or Equipment connected to the electrical system (branch circuit power) shall be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors / ratings, provide all required items from a single manufacturer (i.e.: provide all lightguide termination panels from a single manufacturer, UON).
3. Where the Contract Document require materials or devices designed to be mounted within or sub-assemblies of another product, provide all required items from a single manufacturer.

E. Not every product listed in Part 2 may be required to satisfy the project design intent. Reference floorplan drawings, one-line diagrams, schedules, details, and specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed shall bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

H. Substitution Requests:

1. Substitution requests must be accompanied with a written statement of benefit or savings realized.
2. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment.
3. Manufacturer’s cut sheets for proposed substitutions must accompany each request.
4. Where substitutions alter the space requirements of equipment locations reflected in the Contract Documents, the Contractor is required to submit revised drawings indicating proposed layout of equipment.

2.2 DISTRIBUTION OPTICAL FIBER CABLE (RISER / BACKBONE)

A. Distribution Optical Fiber Cabling shall be armored, OM3 / 4 rated, multi-strand, 50 / 125µm construction specifically designed, manufactured, tested, UL listed, and warranted for use for intended application.

B. Distribution Optical Fiber Cabling for **interior use** shall possess the following characteristics:

1. Multiple-strand construction – 6 / 12 / 24 strands
2. Single strand optical attenuation - < 2.0 dB per km
3. Armor jacketed with metallic shield (spiral wound steel under PE or PVC outer sheath).
4. OFNR / OFCR / OFNP / OFCP Rated as installation conditions require.
5. Color coded strands per industry standards

C. Distribution Optical Fiber Cabling for **exterior use** shall possess the following additional characteristics:

1. Gel Filled / water intrusion blocking construction.
2. Direct burial rated, rodent resistant, high density polyethylene jacket with corrugated metallic shield / armor protective wrap.

D. All communications Optical Fiber Cabling designated as backbone / riser cabling (installed between the main IT equipment room / MDF and remote IT terminations closets / IDF's must be provided within an armored cable assembly

2.3 OPTICAL FIBER CABLE

A. Optical Fiber Cable shall conform to ANSI / TIA / EIA 568-A Commercial Building Telecommunications Cabling Standards and ISO / IEC 11801.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. CommScope, Inc.
3. West-Penn Wire
4. Corning Cable Systems.
5. CSI Technologies Inc.
6. General Cable Technologies Corporation.
7. Superior Essex Inc.
8. 3M Communication Markets Division.

C. **Multi-mode Fiber - Grade 5 (OM3 rated)**: 50 µm core, 125 µm cladding.

1. Multi-mode optical fiber shall be graded-index optical fiber waveguide with the following minimum performance characteristics:

a. Max attenuation: 3.00 dB / Km @ 850 nm
b. Max attenuation: 1.00 dB / Km @ 1300 nm
c. Min bandwidth: 1500 MHz @ 850 nm
d. Min bandwidth: 500 MHz @ 1300 nm
e. Data rate: 1Gb / sec
f. Min Link Length (1Gb): 1000m @ 850nm / 600m @ 1300nm
g. Min Link Length (10Gb): 300m @ 850nm / 300m @ 1300nm

D. **Multi-mode Fiber - Grade 6 (OM4 rated)**: 50 µm core, 125 µm cladding.

1. Multi-mode optical fiber shall be graded-index optical fiber waveguide with the following minimum performance characteristics:

a. Max attenuation: 3.00 dB / Km @ 850 nm
b. Max attenuation: 1.00 dB / Km @ 1300 nm
c. Min bandwidth: 3000 MHz @ 850 nm
d. Min bandwidth: 500 MHz @ 1300 nm
e. Data rate: 10Gb / sec
f. Min Link Length (1Gb): >1000m @ 850nm / 600m @ 1300nm
g. Min Link Length (10Gb): 500m @ 850nm / 300m @ 1300nm

E. **Single-mode Fiber – Enhanced (OS2 rated)**: 8.9 µm core, 125 µm cladding.

1. Single-mode optical fiber shall be graded-index optical fiber waveguide with the following minimum performance characteristics:

a. Max attenuation: 0.50 dB / Km @ 1310 nm
b. Max attenuation: 0.40 dB / Km @ 1550 nm
c. Data rate: 10Gb / 40Gb / sec
d. Min Link Length (10Gb): --- @ 1310nm / 10km @ 1550nm

F. Quantity of strands to be normally manufactured product. Strand count – 6 / 12 / 24. Refer to drawings for quantity of fiber strands required, jacket construction, buffer type.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA / EIA-568-B.3 for performance specifications.
3. Comply with TIA-492AAAB for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose: Type OFN / OFC, OFNG / OFCG
b. Riser Rated: Type OFNR / OFCR, complying with UL 1666.
c. Plenum Rated: Type OFNP / OFCP, complying with NFPA 262.
d. UL Listed for application / use
e. Unrated optical fiber cabling not permitted.

2.4 OPTICAL FIBER CABLING HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. CommScope, Inc.
3. Corning Cable Systems.
4. CSI Technologies Inc.
5. General Cable Technologies Corporation.
6. Superior Essex Inc.
7. 3M Communication Markets Division.

B. Reference Specification Section 27 1100 (Communications Equipment Room Fittings) for additional Optical Fiber Cable terminations hardware requirements.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Coordinate all Optical Fiber termination connectors with Owner's Network Administrator before purchase of LIU's, patch panels, or other optical fiber terminations. Provide equipment with Owner desired connectors (ST / SC / SMA / MTRJ / FC/LC).

B. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

3.2 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, "Good Workmanship in Electrical Construction" for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used

to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12' AFF. Cabling may be installed free-run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12' AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Optical Fiber Cabling

1. Optical Fiber Cabling installed concealed in walls, soffits, or inaccessible ceiling spaces shall be installed within metallic conduits (EMT).
2. Exposed Optical Fiber cabling shall be installed within EMT or metallic surface mount raceways.
3. Optical Fiber cabling installed above accessible ceilings may be installed free-run via cable supports / j-hooks attached to building structure in lieu of raceways.
4. Install cabling in neat and workmanlike manner. Neatly bundle and tie cables. Maintain EIA / TIA / BICSI recommended cable bend radius for each cable type installed.

5. Leave 5-foot strand service loop at point of termination. Maintain manufacturer's recommended bend radius. Neatly dress fiber strands and enclose in appropriate strand manager.
6. Install per NEC and Life Safety requirements.
7. Replace any cable exhibiting physical defects such as cuts, tears, or bulges.
8. Label each cable installed per ANSI / TIA / EIA-606-A/B requirements.
9. Firestop all openings where cabling is installed through a rated wall.

3.3 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to cabling installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Verify all required LAN / WAN data network elements required for the proper operation are in place and functional. Coordinate installation with facility network administrator.

D. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for additional project Execution requirements.

3.4 COORDINATION

A. Contractor shall provide information, instruction, and manufacturer specific / specialty back boxes and / or other custom raceway material(s) to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Coordinate the layout and installation of Communications Optical Fiber Cabling with other telecommunications and LAN / WAN equipment and service providers.

C. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

3.5 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with ANSI / TIA / EIA-606-A/B. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA / EIA-606-A/B for Class 2 level of administration.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA / EIA-606-A/B. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA / EIA-606-A/B.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA / EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Pre-Installation Performance Tests:
    a. Reel test optical fiber cabling prior to installation. Confirm strand continuity and optical attenuation meets or exceeds manufacturer’s specifications.
    b. Test instruments shall meet or exceed applicable requirements in TIA / EIA-568-B.1.
4. Final Verification & Performance Tests:
    a. Test each installed Optical Fiber Strand using a certified and calibrated Optical Time-Domain Reflectometer (OTDR).
    b. Test Multi-mode strands at 850 nm and 1300 nm. Test Single-mode strands at 1310 nm and 1550 nm. Test for the following:
        1) Optical Link length
        2) Optical Attenuation by frequency

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Results of testing and remediation work shall be Manufacturer's Certification and Warranty.

END OF SECTION

SECTION 27 1533 – COMMUNICATIONS COAXIAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. This Section, along with related Drawings and Specification Sections, shall define the requirements for Cable & Satellite Television Distribution, CCTV Surveillance, and other Technology Systems backbone, riser, and horizontal distribution Communications Coaxial Cabling. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Coaxial Cabling system.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional integration requirements.

D. Special coordination with the following Sections is required. Submit the following sections together per Section 27 0500-1.5-C:

1. Section 27 1100 (Communications Equipment Room Fittings)
2. Section 27 1513 (Communications Copper Cabling)
3. Section 27 1523 (Communications Optical Fiber Cabling)

1.2 SUMMARY

A. It is the intent of This Section and related Sections to define and require a complete, manufacturer certified and warranted Communications Structured Cabling system.

B. Communications Coaxial Cabling comprise a part of the physical layer / Communications Structured Cabling system for all Voice, Data Network, Audio / Video, Television Signal Distribution, Security, Surveillance, Access Control, Intercom, and other allied Technology Systems being implemented for this projects scope of work.

C. A complete Communications Structured Cabling system consists of backbone cabling, riser cabling, patch / terminations panels, termination / equipment racks, backboards, cross-connects, mechanical terminations, patch cords or jumpers, wall / ceiling / floor mounted termination jacks & plates, and cabling identification system.

D. Other Communications Structured Cabling system components include materials and installation practices listed in Specification Section 27 1100 (Communications Equipment Room Fittings).

E. Communications Coaxial Cabling shall be provided and installed with specific ratings listed in floorplan, riser, backbone, and campus distribution diagrams. Where they differ, Cabling ratings required by Authority Having Jurisdiction (AHJ) supersede those found in the Contract Documents.

F. Communications Coaxial Cabling primary use is for signal transport and distribution of RF / Broadband CATV Television programming systems. Coordinate the installation and termination of coaxial cabling, taps, and splitters with the Television Programming System Provider.

G. Communications Coaxial Cabling may be additionally referred to in the Contract Documents with the any of following terms:

1. CATV cabling
2. SATV cabling
3. MATV cabling
4. RG-6 / 11 / 58 cabling
5. Series 412 / 500 / 750 / 1000 cabling
6. Semi-flex
7. Leaky coax
8. Antenna cabling
9. 50Ω / 75Ω cabling

H. The installation of the Communications Coaxial Cabling shall be coordinated and integrated with Copper Cabling, Optical Fiber Cabling, and other related Technology Systems listed in Specification Section 27 0500 Part 1.1-D (Technology Systems – General Conditions).

I. Communications Coaxial Cabling installed through and / or terminated in outdoor / exterior locations must be gel filled / wet location rated cabling. If Communications Copper Cabling extends beyond 50 feet outside the foundation of the structure, surge suppression / TVSS protection must be provided within 15 feet of cable entrance into the building. Reference NEC Article 830 for complete code requirements.

J. The Contractor shall furnish, deliver, and install all materials and labor required for a fully functional, tested, and manufacturer warranted Communications Coaxial Cabling system. Include any miscellaneous materials, parts, terminations, and / or supplies necessary for proper operation, but not specifically mentioned. Provide all labor, materials, and supervision to test, adjust, and calibrate the system to ANSI / TIA / EIA / BICSI standards.

1.3 DEFINITIONS

A. Following is a listing of system specific abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1.	BICSI	Building Industry Consulting Service International
2.	CATV	Cable Television
3.	IDC	Insulation Displacement Connector
4.	IDF	Intermediate Distribution Frame
5.	IP	Internet protocol.
6.	ITC	Intermediate Terminations Closet
7.	LAN	Local area network
8.	MATV	Master Antenna System (off-air broadcast television)
9.	MDF	Main Distribution Frame
10.	MPOE	Main Point of Entry (communications demarcation location)
11.	SATV	Satellite Television
12.	TC	Terminations / Telecommunications Closet
13.	UON	Unless Otherwise Noted
14.	UPS	Uninterruptible power supply
15.	WAN	Wide area network.

B. Reference Specification Section 27 0500-1.3 for a more comprehensive listing of Contract Document definitions.

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals shall be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options shall be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor shall clearly indicate which model / type is being provided for each application.

C. Shop Drawings: Include plans, elevations, sections, details, and details on integration with other work.

1. Detail equipment assemblies and indicate dimensions, weights, options, required clearances, method of field assembly, components, and location and size of each field connection.

2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types, signal levels, and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals shall be made in compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

1.7 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where “Approved Equal” is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following:

1. BICSI Telecommunications Distribution Design Manual (TDDM)
2. BICSI Customer Owned Outside Plant Design Manual (CO-OSP)
3. Americans with Disabilities Act (ADA)
4. ANSI / TIA / EIA-568-B: Commercial Building Telecommunications Cabling Standard
5. ANSI / TIA / EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
6. EIA / TIA-606-A/B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
7. EIA / TIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
8. NFPA 70 (latest edition adopted by AHJ)
9. NEMA 250
10. ANSI / NECA / BICSI 568: Standard for Installing Commercial Building Telecommunications Cabling

C. Technology Systems Installers tendering proposals for work defined in this and related sections, must meet the qualifications listed in Specification Section 27 0500-1.9 (Technology Systems – General Conditions).

1.8 WARRANTIES AND REMEDIATION

A. General Warranty: The Contractor must warrant the Communications Coaxial Cabling against defects in installation and workmanship, including labor and parts, for a period of not less than one year from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Manufacturer's Warranty: Manufacturer's standard certification and warranty in which manufacturer agrees to repair or replace components and / or equipment that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: Ten Years from date of system Final Acceptance.

C. Reference Specification Section 27 0500-1.8 (Technology Systems - General Conditions) for additional warranty and remediation requirements.

1.9 COORDINATION

A. Contractor must supply and deliver all manufacturer specific / specialty back boxes, installation instructions, information, and / or other custom raceway material(s) for technology systems devices to be installed to raceway installer prior to the commencement of his work. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification Section 27 0500 (Technology Systems – General Conditions).

C. Products and / or Equipment connected to the electrical system (branch circuit power) shall be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors / ratings, provide all required items from a single manufacturer (i.e.: provide all coaxial cabling from a single manufacturer, UON).
3. Where the Contract Document require materials or devices designed to be mounted within or sub-assemblies of another product, provide all required items from a single manufacturer.

E. Not every product listed in Part 2 may be required to satisfy the project design intent. Reference floorplan drawings, one-line diagrams, schedules, details, and specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed shall bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

H. Substitution Requests:

1. Substitution requests must be accompanied with a written statement of benefit or savings realized.
2. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment.
3. Manufacturer’s cut sheets for proposed substitutions must accompany each request.
4. Where substitutions alter the space requirements of equipment locations reflected in the Contract Documents, the Contractor is required to submit revised drawings indicating proposed layout of equipment.

2.2 COAXIAL CABLING MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. CommScope, Inc.
3. CSI Technologies Inc.

4. General Cable Technologies Corporation.
5. Superior Essex Inc.
6. 3M Communication Markets Division.

B. Reference Specification Section 27 1100 (Communications Equipment Room Fittings) for additional Optical Fiber Cable terminations hardware requirements.

C. Backbone / Riser Broadband Coaxial Cabling for interior use shall possess the following characteristics:

1. Television Signal: copper-clad aluminum center conductor, aluminum braid and foil, quad-shield
2. CATVP / CATVR / CMP / CMR Rated

D. Backbone / Riser Coaxial Cabling for exterior use shall possess the following characteristics:

1. Television Signal: copper-clad aluminum center conductor, aluminum braid and foil, quad-shield
2. Gel Filled – exterior rated
3. High density polyethylene jacketed with corrugated metallic shield / armor

2.3 TELEVISION SIGNAL / MASTER ANTENNA / SATELLITE COAXIAL CABLE SPECIFICATIONS (CATV / MATV / SATV)

A. Coaxial Cabling for use in Television Signal / Master Antenna / Satellite Signal Reception broadband video signal distribution shall be 75 Ω construction, gas injected PE dielectric, semi-flex coaxial cables, constructed and specifically designed, manufactured, tested, UL listed, and warranted for use for in broadband voice / digital / data applications.

B. CATV / MATV / SATV Coaxial Cabling for shall possess the following characteristics:

C. Broadband CATV Horizontal Drop Cable – RG-6 / U

1. 75 Ω coaxial horizontal distribution cabling with the following minimum performance characteristics:

a. Center Conductor: 18 AWG
b. Cable O.D.: 0.275 inch
c. Capacitance: 16.3 pF / ft
d. Bandwidth: 55-1000 MHz
e. Attenuation Lo: 4.82 dB / 100 ft @ 50 MHz
f. Attenuation Hi: 21.73 dB / 100 ft @ 1000 MHz

D. Broadband CATV Horizontal Drop Cable – RG-11 / U

1. 75 Ω coaxial horizontal distribution cabling with the following minimum performance characteristics:

a. Center Conductor: 14 AWG
b. Cable O.D.: 0.405 inch
c. Capacitance: 16.0 pF / ft
d. Bandwidth: 55-1000 MHz
e. Attenuation Lo: 3.06 dB / 100 ft @ 50 MHz
f. Attenuation Hi: 14.55 dB / 100 ft @ 1000 MHz

2.4 DISTRIBUTED ANTENNA COAXIAL CABLE (DAS)

A. Coaxial Cabling for use in DAS signal distribution shall be 50 Ω construction, air dielectric, semi-flex coaxial cables, constructed and specifically designed, manufactured, tested, UL listed, and warranted for use for in cellular / PCS / 4G / LTE applications.

A. Distributed Antenna Coaxial Cable shall possess the following characteristics:

1. Copper-clad aluminum center conductor
2. Non-pressurized air-dielectric
3. Solid aluminum corrugated tube outer conductor / shield
4. CATVP, UL-910 rated

B. DAS Antenna Cabling – RG-8 / 50 Ohm

1. 50 Ω coaxial riser & distribution cabling with the following minimum performance characteristics:

a. Center Conductor: 4.78 mm
b. Cable O.D.: 0.615 inch
c. Capacitance: 22.0 pF / ft
d. Bandwidth: 100 MHz – 6 GHz
e. Attenuation Lo: 0.70 dB / 100 ft @ 100 MHz
f. Attenuation Hi: 6.80 dB / 100 ft @ 6000 MHz

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

3.2 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, “Good Workmanship in Electrical Construction” for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12’ AFF. Cabling may be installed free-run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12’ AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

L. Coaxial Cabling

1. Coaxial Cabling installed concealed in walls, soffits, or inaccessible ceiling spaces shall be installed within metallic conduits (EMT UON.
2. Exposed Coaxial cabling shall be installed within EMT or metallic surface mount raceways.
3. Coaxial cabling installed above accessible ceilings may be installed free-run via cable supports / j-hooks attached to building structure in lieu of raceways.
4. Install cabling in neat and workmanlike manner. Neatly bundle and tie cables. Maintain EIA / TIA / BICSI recommended cable bend radius for each cable type installed.
5. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
    a. Pull cables simultaneously if more than one is being installed in the same raceway.
    b. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
    c. Use pulling means including fish tape, cable, rope, and basket-weave wire / cable grips that will not damage media or raceway.
6. Install per NEC and Life Safety requirements.
7. Replace any cable exhibiting physical defects such as cuts, tears, or bulges.
8. Label each cable installed per ANSI / TIA / EIA-606-A/B requirements.
9. Firestop all openings where cabling is installed through a rated wall.

M. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48” cabling pre-termination loop at field devices (free-run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18” cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.
3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

N. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free-run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.

O. Cable Identification: Each wire and / or cable installed must be permanently identified with legibly printed, unique cabling identification label. Cable Labeling must conform with the following:

1. Cabling Identification label must be mechanically printed. Handwritten cabling identification labels are not acceptable except for temporary identification during installation. Handwritten labels must be replaced with mechanically printed labels.
2. Cabling Identification labels must be affixed to each cable within 16” of termination.
3. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to and cable type.

P. Grounding: Take all necessary precautions to minimize electromagnetic and / or electrostatic interference. Grounding bars in equipment racks must be bonded to grounding bars in equipment rooms, IDF, and / or building ground system. Comply with NEC Article 250.

3.3 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to cabling installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Verify all required LAN / WAN data network elements required for the proper operation are in place and functional. Coordinate installation with facility network administrator.

D. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for additional project Execution requirements.

3.4 EQUIPMENT RACKS

A. In seismically active areas, provide the following:

1. Zone 2B or greater

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.
b. Provide rear support for mounted equipment weighing in excess of 10 lbs. / RU, or where the equipment depth exceeds 3.0 times its height (in RU's).

2. Zone 3 or greater

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.
b. Provide rear support for mounted equipment weighing in excess of 5 lbs./RU, or where the equipment depth exceeds 2.5 times its height (in RU's).
c. Provide additional bracing to side walls. Side wall bracing to be installed at the top of each installed rack.

3.5 COORDINATION

A. Contractor shall provide information, instruction, and manufacturer specific / specialty back boxes and / or other custom raceway material(s) to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Coordinate the layout and installation of Communications Coaxial Cabling with other telecommunications and LAN / WAN equipment and service providers.

C. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with ANSI / TIA / EIA-606-A/B. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 2.

2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA / EIA-606-A/B for Class 2 level of administration.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA / EIA-606-A/B. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA / EIA-606-A/B.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Pre-Installation Performance Tests:

a. Reel test coaxial cabling prior to installation. Confirm cabling meets or exceeds manufacturer's specifications.

b. Test instruments shall meet or exceed applicable requirements in TIA / EIA-568-B.1.

2. Final Verification & Performance Tests:

a. Test each installed Coaxial using a certified and calibrated spectrum analyzer.

b. Sweep test each cable 5-1000 MHz for the following:

1) Shorts / open
2) Bandwidth attenuation
3) Continuity of shield to building ground

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Results of testing and remediation work shall be Manufacturer's Certification and Warranty.

END OF SECTION

SECTION 27 4100 – AUDIO / VIDEO SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. Contract Document drawings indicate general locations and quantities of the Audio / Video Systems. The design documents are for general guidance and reference in understanding the design intent. Exact routing, placement, distances, elevations, and orientation of the Audio / Video Systems components will be determined by Interior Design, Civil, and Structural engineering design documents, as well as field conditions.

C. Reference Specification Sections 27 0500 (Technology Systems - General Conditions) for additional requirements.

D. Coordinate the requirements of this system with those listed systems in 27 0500-1.1. D.

1.2 SUMMARY

A. Audio / Video Systems provide this project with a full integration of Sound Reinforcement, Visual Display, User Interface & Control, and Local Area Network (LAN) components required to facilitate instruction in a meeting room / presentation setting. Specific system requirements will be documented through floorplan drawings, one-line diagrams, installation details, and these Specifications Sections.

i. Sound Systems: Systems will include audio / video input / output plates (A/VIO), signal mixers, zone controls, Digital Signal Processors, audio amplifiers, signal cabling and ceiling, wall mounted, and / or suspended loudspeakers. System head-end electronics will be mounted into EIA Standard equipment racks in MDF / IDF spaces. Sound Systems will be integrated with Visual Display Systems, User Interface & Control Systems, and the LAN.

ii. Visual Display Systems: Systems will include flat panel displays, presentation grade Smart-TV’s, entertainment grade Smart-TV’s, audio / video input / output plates (A/VIO), computer workstations, and networked content playback devices (Roku, AppletTV, Amazon Fire sticks). System head-end electronics will be mounted into recessed wall mount electronics enclosures behind displays. Visual Display Systems will be integrated with Sound Systems, and User Interface & Control Systems.

iii. User Interface & Control Systems: Systems will include manufacturers IR and RF user interfaces that accompany other system components.

B. Audio / Video System electronics requiring rack mount installation will be permanently mounted and installed into EIA standard 19" wall / floor mount metallic equipment racks as located in the Contract Documents. System configuration will be reflected in space specific one-line diagrams, through this Specification Section, and according to industry best practices. Audio / Video System sub components will include the following:

C. CONFERENCE ROOMS / MEETING ROOMS: Provide each meeting / assembly space with the following Audio / Video features:

i. Presentation Grade Smart-TV – the Presentation Grade Smart-TV will be a wall mount, professional quality, LED backlit, wide-screen, 1080p visual presentation appliance that can function as both a television and as a computer-based display monitor. The Presentation Grade Smart-TV supplied will possess multiple HDMI and SVGA inputs, contain an RF tuner capable of capturing, demodulating, and displaying both analog RF CATV and digital broadcast HDTV signals, and be capable of remote control by a User Interface & Control System (RS-232 / IP). To be considered a Smart-TV, the Presentation Grade display must possess native (on board / built-in) applications such as web browsers, Netflix, YouTube, and / or Skype. The Presentation Grade Smart-TV will include high-quality on-board side mount speakers / lower sound bar for audio playback.

ii. Entertainment Grade Smart-TV – the Entertainment Grade Smart-TV will be a wall mount, professional quality, LED backlit, wide-screen, 1080p visual presentation appliance that can function as both a television and as a computer-based display monitor. The Presentation Grade Smart-TV supplied will possess multiple HDMI and SVGA inputs, contain an RF tuner capable of capturing, demodulating, and displaying both analog RF CATV and digital broadcast HDTV signals, [and be capable of remote control by a User Interface & Control System (RS-232 / IP).] To be considered a Smart-TV, the Entertainment Grade display must possess a minimum of six (6) native (on board / built-in) applications such as a Flash-enabled web browser, Netflix, YouTube, Facebook, Hulu / Hulu+, Pandora, Vudu, and / or Skype. The Presentation Grade Smart-TV will include high-quality on-board side mount speakers / lower sound bar for audio playback.

iii. A/VIO Input Plates - A/VIO Input Plates allow for consolidated, single point of connection access to the Audio / Video systems for video input, audio input, LAN and voice system access, electrical branch circuit power, and control. Reference drawings for specific A/VIO Input Plate configuration.

iv. A/VIO Floor Boxes - A/VIO Floor Boxes allow for consolidated, single point of connection access to the Audio / Video systems for video inputs, audio inputs, LAN and voice system access, electrical branch circuit power, and control. A/VIO Floor Boxes beneath conference room / boardroom tables,

instructor lecterns, and / or “head-table” locations are to contain the primary audio / video inputs for the in-room presentation system. Reference drawings for specific A/VIO Floor Box configuration.

v. Table Top A/VIO Input Recess Box - Table Top A/VIO Input Recess Boxes allow for consolidated, single point of connection access to the Audio / Video systems for video input, audio input, LAN and voice system access, electrical branch circuit power, and / or control functionality. Table Top A/VIO Input Recess Boxes will contain decorative metallic covers with cable access slots so they can be used in-place with their covers closed. Provide umbilical cords from Table Top A/VIO box to the A/VIO Floor Box below the furniture. Reference drawings for specific Table Top A/VIO Input Recess Boxes configuration.

vi. Network Video / Media Streaming Appliance – select Entertainment Grade Smart-TV’s will be paired with Network Video / Media Streaming Appliances designed to aggregate content from the Internet as well as from local Wi-Fi streamed sources. Examples of acceptable Network Video / Media Streaming Appliances are as follows:

1) Roku 3
2) AppleTV
3) GoogleTV
4) Android TV Boxes
5) WD TV-Live
6) ChromeBox
7) ChromeCast

D. FITNESS CENTER: Provide the Fitness space with the following Audio / Video features:

i. Entertainment Display(s) – the Entertainment Display shall be a 70”+ LED backlit LCD display “Smart TV” with integrated applications to include (but not limited to) Netflix, Amazon Prime, Hulu+, Vudu, YouTube, Skype, AllShare / AirPlay capable. The Entertainment Display shall be provided with integrated SD / HDTV tuner, multiple HDMI inputs, and integrated, side mount / sound bar speakers. Entertainment Display shall be made capable of providing an audio output to the Background Music system located in the fitness center. Entertainment Displays supplied will be capable of remote control by the User Interface & Control System (RS-232 / IP).

ii. Fitness A/VIO Floor Box - A/VIO Floor Box allow for consolidated, single point of connection access to the Fitness Center equipment for video inputs, audio inputs, Ethernet access, and electrical branch circuit power. A/VIO Floor Boxes adjacent fitness equipment locations are to contain the data / CATV and power connectivity required by fitness equipment on board electronics. Reference drawings for specific Fitness A/VIO Floor Box configuration.

iii. Network Video / Media Streaming Appliance – select Entertainment Grade Smart-TV's will be paired with Network Video / Media Streaming Appliances designed to aggregate content from the Internet as well as from local Wi-Fi streamed sources. Examples of acceptable Network Video / Media Streaming Appliances are as follows:

1) Roku 3
2) AppleTV
3) GoogleTV
4) Android TV Boxes
5) WD TV-Live
6) ChromeBox
7) ChromeCast

E. DAY ROOMS / DINING: Provide each day room / relaxation space with the following Audio / Video features:

i. Entertainment Display(s) – the Entertainment Display shall be a 70"+ LED backlit LCD display "Smart TV" with integrated applications to include (but not limited to) Netflix, Amazon Prime, Hulu+, Vudu, YouTube, Skype, AllShare / AirPlay capable. The Entertainment Display shall be provided with integrated SD / HDTV tuner, multiple HDMI inputs, and integrated, side mount / sound bar speakers. Entertainment Display shall be made capable of providing an audio output to the Background Music system located in the fitness center. Entertainment Displays supplied will be capable of remote control by the User Interface & Control System (RS-232 / IP).

ii. Network Video / Media Streaming Appliance – select Entertainment Grade Smart-TV's will be paired with Network Video / Media Streaming Appliances designed to aggregate content from the Internet as well as from local Wi-Fi streamed sources. Examples of acceptable Network Video / Media Streaming Appliances are as follows:

1) Roku 3
2) AppleTV
3) GoogleTV
4) Android TV Boxes
5) WD TV-Live
6) ChromeBox
7) ChromeCast

F. CORRIDORS / GATHERING SPACES: Provide the Corridors / Gathering Spaces with flush ceiling mount / wall mount paging speakers as reflected in the drawings. Two separate paging zones will be established, one for Fire, the second for Police. Input to the paging system shall be an audio output from the VoIP Telephone system

i. Audio System – the Corridor / Gathering Space Audio System will be comprised of a multiple-source, dual-zone, 70v distributed ceiling mount speakers.

i. Network Video / Media Streaming Appliance – select Entertainment Grade Smart-TV's will be paired with Network Video / Media Streaming Appliances designed to aggregate content from the Internet as well as from local Wi-Fi streamed sources. Examples of acceptable Network Video / Media Streaming Appliances are as follows:

1) Roku 3
2) AppleTV
3) GoogleTV
4) Android TV Boxes
5) WD TV-Live
6) ChromeBox
7) ChromeCast

G. Provide all Audio / Video System head-end equipment with TVSS surge protection equipment at the point of connection to branch circuit power. UPS protection will additionally be provided to low power draw equipment requiring extended power up / re-booting times.

H. Any PC Workstations or Servers required as a part of this system must be provided complete with Operating System (OS), required system operations / support software, keyboards, displays, monitors, and all required peripheral equipment necessary for a complete and operational Audio / Video system installation. Coordinate procurement, warranty, and support with the Owners IT Support Group.

I. Bidders are free to suggest alternate manufacturer's products in their proposals tendered. Due to the complexity of product architectures available in the marketplace, the bidder is advised to adhere closely to the Proposal Tender requirements of this section. Reference Specification Section 27 0500-1.04 (Technology Systems - General Conditions) for specific proposal tender and substitution requirements.

1.3 DEFINITIONS

A. Following is a listing of system specific abbreviations and acronyms that may be found within the Contract Documents. This listing is offered as an aid to assist in the interpretation of the design intent. This list is not intended to be comprehensive, nor will all abbreviations, acronyms, and terms listed below be used within the Contract Documents.

1. BGM Background Music: A light, non-vocal, music program without featured artist or lyrics. Played at low levels through distributed sound systems to provide a desired ambiance. System output levels typically between 70 dB-SPL and 85 dB-SPL.

2. FGM Foreground Music: A more dynamic musical program source that may contain lyrics and may be performed by a recognized, feature artist. Played at higher levels through both distributed and / or localized sound systems to provide entertainment as well as establishing a livelier social environment. System output levels typically between 80 dB-SPL and 95 dB-SPL.

3. CMS Custom Music Services: Sometimes referred to as Music Styling by service providers. Provides a more customized blend of music that changes tempo and content throughout the day. May include locally relevant content, musical styles, and / or performers. Played at a variety of levels, typically above BGM but not to the full output of FGM. Systems designed to provide CMS may include ambient level compensators to provide a more uniform output as audience sizes and noise levels change. System output levels typically between 75 dB-SPL and 90 dB-SPL.

4. PA Public Address: Program content comprised mainly of voice communications. Can include coded communications tones. Typically reproduced through zoned and distributed sound systems to provide signaling and communications through a wide variety of spaces / areas. May include interior and exterior spaces.

5. SR Sound Reinforcement: High performance, live entertainment-based program material. Provides for the live amplification of voice, musical instruments, percussion, pre-recorded music and video. This system has the widest variation of output levels, approaching concert level reinforcement. System output levels typically 85 dB-SPL and above. System output levels can approach 120 dB-SPL if system design allows.

6. IP Internet protocol: Means of communications and control through an Ethernet network. Typical communications protocol of LAN's and WAN's.

7. LAN Local Area Network: Typically integrated with Sound Systems to provide signal routing, system monitoring, and control. Usually localized to one specific building or project.

8. DSP Digital Signal Processors: Programmable, flexible audio workstations designed to route, mix, equalize, provide gain management to, and control a variety of audio program sources. Typically integrated with a User Interface & Control system.

9. PC Personal computer.

10. TCP Transmission control protocol - connects hosts on the Internet.

11. UPS Uninterruptible power supply.

12. UTP Unshielded Twisted-Pair. Generic term for CAT-5e / 6 network cabling.

13. WAN Wide Area Network: Typically integrated with LAN's to provide wide area routing of Sound system program, monitoring, and control. Can be global in reach. Includes the Internet / World Wide Web. Scope of work usually limited to LAN's and their connection to the Internet.

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals must be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Manufacturer cut sheets to include information on rated capacities, performance characteristics, operational features, dimensions, weights, power requirements, heat release, furnished specialties, and / or accessories.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options must be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor must clearly indicate which model / type is being provided for each application.
2. Unless specifically requested, the Contractor shall not submit manufacturer product data in the form of owner's manuals, operations manuals, installation manuals, and / or non-English publications. Information received in this manner will be rejected and returned un-reviewed.
3. Owner's manuals, operations manuals, and installation manuals are a part of Closeout Documents requirements.

C. One-Line / Block Diagrams: Submittals of systems requiring the interconnection of multiple product types or the inter-coordination of multiple systems must contain one-line and / or block diagrams indicating the specifics of interconnection for the specific systems / product types provided.

1. One-Line Diagrams must identify each piece of equipment being installed, sizes and quantities of conductors, cable numbering / identification scheme, and connector & terminations information.
2. Signal and control connections must identify communications protocol, where this is otherwise not clear.

3. One-Line / Block Diagrams submitted for approval must be specific to this project and not typical and / or case study drawings.
4. Reproduction of any part of the Contract Documents as a basis for submittal components is prohibited. Submittals containing portions of the Contract Documents will be rejected.

D. Shop Drawings (Special Fabrications / Custom Integration): Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. System Block Diagrams: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes. Provide one single-line diagram for each system / equipment rack location identified in the drawings.
3. Programming Block Diagrams: Show single-line functional programming algorithms for each programmable Digital Signal Processor (DSP) included as a part of this work. Single-line diagrams must identify complete signal path from DSP input to DSP output.
4. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
5. UPS: Sizing calculations.

E. Rack Elevations: Equipment Rack layouts (elevations) reflecting each major piece of equipment installed, its relative vertical size, and its position within the rack.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals must be made in compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

1.7 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where “Approved Equal” is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following:

1. Americans with Disabilities Act (ADA)

2. NFPA 70 (latest edition adopted by AHJ)
3. NEMA 250
4. NECA 1, “Good Workmanship in Electrical Construction” for the installation of raceways and cabling.

C. Technology Systems Installers tendering proposals for work defined in this and related sections, must meet the qualifications listed in Specification Section 27 0500-1.9 (Technology Systems – General Conditions).

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Equipment provided must be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. System Head-end: Rated for continuous operation in ambient temperatures of 60° to 85° F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 36° to 122° F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 0° to 122° F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 12 enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30° to plus 122° F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 4X enclosures.

1.9 WARRANTIES AND REMEDIATION

A. General Warranty: The Contractor must warrant the Audio / Video Systems against defects in installation and workmanship, including labor and parts, for a period of one year from the date of system Final Acceptance.

1. The Contractor is not responsible for failures due to improper use, negligence, structural failures (falling water / debris), vandalism, activities of vermin, normal wear-and-tear, and / or Acts of God.

B. Equipment Manufacturer’s Warranty: Manufacturer's standard warranty in which manufacturer agrees to repair or replace components and / or equipment that fails in materials, function, serviceability and / or workmanship within specified warranty period.

1. Minimum Warranty Period: One year from date of system Final Acceptance.

C. Reference Specification Section 27 0500-1.8 (Technology Systems - General Conditions) for additional warranty and remediation requirements.

1.10 COORDINATION

A. Technology Systems Installer must supply and deliver all manufacturer specific / specialty back boxes, installation instructions, information, and / or other custom raceway material(s) for technology systems devices to be installed to raceway installer prior to the commencement of his work. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products and / or Equipment identified by the manufacturer's name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification Section 27 0500 (Technology Systems – General Conditions).

C. Products and / or Equipment connected to the electrical system (branch circuit power) must be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where the Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors, provide all required items from a single manufacturer (i.e.: provide all power amplifiers, ceiling speakers, from a single manufacturer, UON).

3. Where the Contract Documents require materials of devices designed to be mounted within or as a sub-assembly of another product, provide all required items from a single manufacturer.
4. Where the Contract Documents require product that must form a rated, warranted system, provide all required items / components from a single manufacturer and provide written documentation of manufacturers required testing and warrantee.

E. Not every product listed in Part 2 of the Technology Specifications may be required by the project design. Reference floorplan drawings, one-line diagrams, schedules, and details in addition to Technology Systems specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed must bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents but deemed necessary for the proper installation and / or operation of the system must be furnished and installed.

H. Substitution Requests:

1. Substitution requests must be accompanied with a written statement of benefit or savings realized.
2. Proposed substitutions must be functionally equivalent or superior to the base bid design equipment.
3. Manufacturer's cut sheets for proposed substitutions must accompany each request.
4. Where substitutions alter the space requirements of equipment locations reflected in the Contract Documents, the Contractor is required to submit revised drawings indicating proposed layout of equipment.

I. Product substitutions required due to specified products which are found to have been discontinued, replaced, modernized, or no longer available from the intended manufacturer, will be given expedited substitution review providing they contain the specific capabilities and features of the originally specified product. Alert the Architect / Engineer immediately when these substitutions must be made.

2.2 LED BACKLIT SMART-TV / DISPLAY (PRESENTATION GRADE)

A. Presentation Grade LED TV / Displays are to be professional quality, LED backlit, Smart TV flat-panel displays that can function as both televisions and computer-based display monitors.

B. To be considered Presentation Grade, LED TV / Displays must possess the following features at a minimum:

1. 1920x1080p, Full HD resolution

2. 240 Hz refresh rate
3. Dual-core video processor (minimum)
4. LED backlit
5. F-connector (CATV / Broadcast input)
6. NTSC / PAL analog tuner (country dependent)
7. ATSC / QAM digital tuner
8. Minimum four (4) HDMI inputs
9. Minimum one (1) RGB / 15-pin / SVGA computer input
10. Ethernet connection (10 / 100 minimum)
11. 802.11 b / g / n Wi-Fi connectivity
12. RS-232 Serial communications port
13. USB Port
14. Integrated 2.1 onboard speaker system
15. Audio outputs (both optical and analog)
16. DNLA Certified
17. VESA compliant mounting system

C. To be considered a Smart TV, the LED TV / Displays must possess the following native (built-in) applications at a minimum:

1. Netflix
2. Web Browser (Flash enabled)
3. Skype (with auxiliary HD camera)

D. Presentation Grade LED TV / Displays are to be provided complete with appropriate mounting hardware, brackets, housings, safety straps, seismic restraints, connecting cables, and other miscellaneous materials as required for proper operation and as required by local safety codes.

E. Presentation Grade LED TV / Displays are to be provided and installed with sizes and in locations reflected in the floor plan drawings.

F. Basis of Design / Exemplar Product:

1. Sharp Aquos Quattron Series

G. Acceptable Manufacturers:

1. Sharp
2. Samsung
3. LG
4. Panasonic
5. Toshiba
6. Sony
7. Visio
8. Approved Equal

2.3 LED BACKLIT SMART-TV / DISPLAY (ENTERTAINMENT GRADE)

A. Entertainment Grade LED TV / Displays are to be professional quality, LED backlit, Smart TV flat-panel displays that can function as both televisions and computer-based display monitors.

B. To be considered Entertainment Grade, LED TV / Displays must possess the following features at a minimum:

1. 1920x1080p, Full HD resolution
2. 240 Hz refresh rate
3. Active 3D Capable
4. Wireless Keyboard & Mouse (Bluetooth / 2.4GHz)
5. Dual-core video processor (minimum)
6. LED backlit
7. F-connector (CATV / Broadcast input)
8. NTSC / PAL analog tuner (country dependent)
9. ATSC / QAM digital tuner
10. Minimum four (4) HDMI inputs
11. Minimum one (1) RGB / 15-pin / SVGA computer input
12. Ethernet connection (10 / 100 minimum)
13. 802.11 b / g / n Wi-Fi connectivity
14. RS-232 Serial communications port
15. Integrated 2.1 onboard speaker system
16. Audio outputs (both optical and analog)
17. DNLA Certified
18. VESA compliant mounting system
19. Tabletop mount / stand included

C. To be considered a Smart TV, the LED TV / Displays must possess at least six of the following native (built-in) applications at a minimum:

1. Netflix
2. Web Browser
3. YouTube
4. Facebook
5. Pandora
6. Hulu / Hulu+
7. Amazon Prime
8. Vudu
9. Web Browser (Flash enabled)
10. Skype (with auxiliary or integrated HD camera)
11. TV Manufacturer specific app store
12. LED TV / Displays without the required quantity of native applications can be made Smart TV capable with the addition of one of the following:

    a. Roku 3
    b. AppleTV
    c. GoogleTV

d. Android TV Box
e. WD TV Live
f. Chromecast

D. Entertainment Grade LED TV / Displays are to be provided complete with appropriate mounting hardware, brackets, housings, safety straps, seismic restraints, connecting cables, and other miscellaneous materials as required for proper operation and as required by local safety codes.

E. Entertainment Grade LED TV / Displays are to be provided and installed with sizes and in locations reflected in the floor plan drawings.

F. Basis of Design / Exemplar Product:

1. Sharp Aquos Quattron Series

G. Acceptable Manufacturers:

1. Sharp
2. Samsung
3. LG
4. Panasonic
5. Toshiba
6. Sony
7. Visio
8. Approved Equal

2.4 DIGITAL SIGNAL PROCESSORS (DSP)

A. Digital Signal Processors (DSP) are open-architecture programmable rack-mount audio signal processing, routing, and control devices that provide equalization, routing, signal delay, band pass, gain management, scheduling, mixing, logic configuration, and real-time control.

B. The Digital Signal Processors (DSP) shall be configurable through manufacturer provided, graphical, drag-n-drop authoring software. The software platform allows for individually customized system configurations between DSP input and output ports, as well as providing for system configuration. Intended DSP programming algorithms must be submitted in one-line diagram format for approval.

C. Digital Signal Processors (DSP) shall possess the required quantity of analog inputs / outputs as reflected in system one-line diagrams. Minimum A / D, D / A conversion ratios shall be 16 bit, 44.1 kHz sampling rate.

D. Approved DSP's will be capable of distributed processing / audio channel routing through Ethernet network communications such as AVB or Cobranet. Distribution of 32 audio streams or greater preferred.

E. Basis of Design / Exemplar Product:

1. Biamp Tesira.

F. Acceptable Manufacturers:

1. Biamp Tesira
2. Biamp Vocia
3. Symetrix SymNet
4. Approved Equal

2.5 POWER AMPLIFIERS

A. Power Amplifiers are manufactured products designed to deliver the voltage and current required to drive loudspeaker devices to useable sound pressure output levels. Power Amplifiers for use in Audio-Video systems must be manufactured to mount within EIA Standard 19" equipment racks (UON). They must by design, be capable of safely delivering the power and signal required to drive loudspeaker zones connected to their outputs to a minimum of 125% of the rated power of the connected loudspeaker loads. Power Amplifiers are manufactured to operate in one of two environments:

1. Low Impedance Power Amplifiers are designed to be directly coupled to the voice coil or crossover inputs of low impedance loudspeakers / loudspeaker assemblies (8Ω / 4Ω nominal).
2. Constant Voltage Power Amplifiers are designed to drive multi-device zones of transformer coupled loudspeakers. Typical Constant Voltage ratings are 25V, 70V, and 100V.

B. Power Amplifiers with integrated DSP processing:

1. Where audio signal routing, switching, mixing, network distribution, or room combining is not required, power amplifiers may include integral DSP processing, potentially eliminating the need for a separate DSP processor.
2. DSP processing programming algorithms and amplifier cut sheets must be submitted for substitution per the requirements of the contract documents before removal of separate DSP processors can be approved.
3. Power Amplifiers with integrated DSP processing must meet the other requirements of this section.

C. Power Amplifiers must be professional quality and manufactured for professional, commercial, and / or industrial use. Power Amplifiers manufactured primarily for consumer use are not acceptable. Power Amplifiers must meet or exceed the following specifications:

1. Frequency Response:30Hz – 18kHz, +/- 0.5dB
2. Distortion: < 0.20% THD, IMD
3. Noise: > 95dB Signal to Noise Ratio
4. Damping Factor: > 500

D. Low Impedance Power Amplifiers (4Ω / 8Ω) must possess the following features:

1. Must be capable of directly driving 4Ω, 8Ω, and 16Ω loads without the use of impedance matching transformers.
2. Must contain internal protection circuitry designed to self-protect the amplifier outputs under low impedance / short-circuit conditions.
3. May be multiple channel design. Two channel typical, 4 / 6 / 8 channel acceptable.
4. Must be sized to a minimum of 125% and maximum of 250% (>125%, < 250%) of the rated power of all connected loudspeakers.
5. Must possess a minimum of one balanced, line-level, audio input per channel.
6. Power Amplifiers rated 250 watts / RMS / 8Ω or greater per channel must be provided with forced-air cooling as a part of the manufactured design.

E. Constant Voltage Power Amplifiers (25V / 70V / 100V) must possess the following features:

1. Must be capable of directly driving 25V / 70V / 100V loads without the need for external impedance matching transformers.
2. Must be made capable of driving 4Ω, 8Ω, and 16Ω loads through output configuration switches.
3. Must contain internal protection circuitry designed to self-protect the amplifier outputs under low impedance / short-circuit conditions. May be multiple channel design. Two channel typical, 4 / 6 / 8 channel acceptable.
4. Must be sized to 125% or greater of the connected load
5. Must possess a minimum of one balanced, line-level, audio input per channel.
6. Power Amplifiers rated 250 watts / RMS / 70V or greater per channel must be provided with forced-air cooling as a part of the manufactured design.

F. Specific amplifiers make and model numbers provided must be identified in the required Submittals.

G. Acceptable Manufacturers:

1. Crown Audio
2. QSC
3. Bose
4. Lab.Gruppen
5. Mackie
6. Peavey
7. Yamaha
8. Electro-Voice
9. Approved Equal

2.6 LOUDSPEAKERS - GENERAL

A. Loudspeakers models listed in this Section are to communicate design intent and are referenced in both Specifications and Contract Drawings by coded reference. The coded reference contains information on; a) the loudspeakers construction / installation configuration (XX), b) the diameter of the primary transducer (YY), and c) the quality level of the required product (ZZ). A guide to interpreting and understanding the coded references follows:

XXYY-ZZ

B. XX refers to loudspeaker construction / installation configuration.

1. “C” references ceiling flush mount devices
2. “P” references pendant mount / suspended devices
3. “IW” references in-wall flush mount devices
4. “S” references surface mount devices
5. “B” references manufactured box assemblies
6. “L” references Landscape devices
7. “UW” references Underwater devices
8. “LA” references Line Array devices
9. “FM” reference Floor Monitor devices
10. “HF” references high-frequency device
11. “MF” references midrange-frequency device
12. “MH” references Mid / High frequency devices
13. “SB” references subwoofer devices

C. YY refers to the diameter of the loudspeaker assemblies’ primary transducer.

1. “2” references a 2” primary transducer
2. “4” references a 4” to 5.75” primary transducer
3. “6” references a 6” to 7.75” primary transducer
4. “8” references an 8” primary transducer
5. “10” references a 10” primary transducer
6. “12” references a 12” primary transducer
7. “15” references a 15” primary transducer
8. Lack of a numerical YY reference indicates a manufactured assembly. Additional information provided below.

D. ZZ refers to the quality level of the required loudspeaker.

1. Reference specific sections below for additional information on these requirements. Quality designations vary by loudspeaker construction / installation configuration.

2.7 DISTRIBUTED CONSTANT VOLTAGE LOUDSPEAKERS

A. Distributed Constant Voltage Loudspeakers are manufactured loudspeaker assemblies that integrate a 25V / 70V / 100V impedance matching transformer

as a part of their design. Distributed Constant Voltage Loudspeakers may be single transducer or multiple transducer design.

1. Frequency response of provided devices 75 Hz – 16 kHz minimum.
2. Provide Ceiling Mount Loudspeakers complete with manufacturer's back box, mounting support hardware, and decorative grill.
3. Provide Surface Mount Loudspeakers complete with manufacturers mounting support hardware.

B. The impedance matching transformer must be the highest quality, lowest loss design available. The insertion loss of the matching transformer must be less than 1.0 dB. Tap transformer to provide a minimum 95 dB-SPL at ear height seated (4.0" AFF).

C. Provide loudspeaker, loudspeaker mounting hardware, back boxes / backing cans, and impedance matching transformers from the same manufacturer wherever possible.

D. Multiple-transducer Distributed Constant Voltage Loudspeakers will integrate a passive electronic signal dividing crossover as a part of their design. Multiple transducer Distributed Constant Voltage Loudspeakers crossovers will be connected to the secondary winding of the impedance matching transformer.

E. Distributed Constant Voltage Loudspeakers may be manufactured to meet a variety of mounting / installation conditions. Typical installation configurations are as follows:

1. Ceiling Mount (flush)
2. Pendant Mount (suspended, open)
3. In-Wall Mount (flush and surface)
4. Landscape (rock or mushroom style)
5. Underwater (pool light enclosure)

F. C6-01 – High Performance 6" Ceiling Mount Loudspeaker

1. Coaxial 6.5" w / compression HF / Two-way 5.25"x2.25" Transducer, 64-watt matching transformer, deep volume dampened back can, flush ceiling mount grill.

2. Basis of Design / Exemplar Product

   a. Tannoy CMS 601DC
   b. Bose FreeSpace DS-100F
   c. JBL Control 227CT

3. Acceptable Manufacturers:

   a. JBL Professional
   b. Bose
   c. Atlas Sound

d. B&C Speakers
e. Tannoy
f. Approved Equal

G. C6-02 – Premium 6” Ceiling Mount Loudspeaker

1. Coaxial 6.5” Transducer w / Compression HF Driver, 32-watt matching transformer, integrated dampened back can, flush ceiling mount grill.

2. Basis of Design / Exemplar Product

a. Tannoy CMS 601
b. Bose FreeSpace DS-40F
c. JBL Control 226CT

3. Acceptable Manufacturers:

a. JBL Professional
b. Bose
c. Atlas Sound
d. B&C Speakers
e. Tannoy
f. Approved Equal

H. C6-03 – Standard 6” Ceiling Mount Loudspeaker

1. Coaxial 6.5” Transducer / 0.75” Tweeter, 32-watt matching transformer, integrated dampened back can, flush ceiling mount grill.

2. Basis of Design / Exemplar Product

a. Tannoy CVS 6
b. JBL Control 26CT

3. Acceptable Manufacturers:

a. JBL Professional
b. Atlas Sound
c. B&C Speakers
d. Tannoy
e. Approved Equal

I. C4-01 – High Performance 4” Ceiling Mount Loudspeaker

1. Coaxial 4” Transducer, 32-watt matching transformer, dampened back can, flush ceiling mount grill.

2. Basis of Design / Exemplar Product

a. Tannoy CMS 501DC

b. Bose FreeSpace DS-100F
c. JBL Control 24CT

3. Acceptable Manufacturers:

a. JBL Professional
b. Bose
c. Atlas Sound
d. B&C Speakers
e. Tannoy
f. Approved Equal

J. C4-02 – Premium 4” Ceiling Mount Loudspeaker

1. 4” Cone / 0.5” Tweeter Transducers, 25-watt matching transformer, integrated back can, flush ceiling mount grill.

2. Full-range 4.5” single cone driver in a ported enclosure. Integrated multi-tap transformer and back can. Flush mount grill.

3. Basis of Design / Exemplar Product

a. Tannoy CMS 501 / CVS 4
b. Bose FreeSpace DS-40F
c. JBL Control 24CT MicroPlus

4. Acceptable Manufacturers:

a. JBL Professional
b. Bose
c. Atlas Sound
d. B&C Speakers
e. Tannoy
f. Approved Equal

K. C4-03 – Standard 4” Ceiling Mount Loudspeaker

1. 4” Cone / 0.5” Tweeter Transducers, 10-watt matching transformer, integrated dampened back can, flush ceiling mount grill.

2. Basis of Design / Exemplar Product

a. Tannoy CVS 4 Micro
b. Bose DS-16F
c. JBL Control 24CT Micro.

3. Acceptable Manufacturers:

a. JBL Professional
b. Bose

c. Atlas Sound
d. B&C Speakers
e. Tannoy
f. Approved Equal

2.8 SUSPENDED PENDANT MOUNT CONSTANT VOLTAGE LOUDSPEAKERS

A. Where Flush Mount Ceiling Speaker installation is not possible, provide Suspended Pendant Mount Constant Voltage Loudspeakers.

B. P6-01 – High Performance 6” Pendant Mount Loudspeaker

1. 6” coaxial environmentally protected driver, 60-watt matching transformer, and deep volume dampened ABS enclosure with powder coated grille, designed for interior / exterior suspended installation. Speaker to include seismic rated hanging hardware.

2. Basis of Design / Exemplar Product

a. SoundTube HP690i

3. Acceptable Manufacturers:

a. Tannoy
b. SoundTube
c. Approved Equal

C. P6-02 – Premium 6” Grade Pendant Mount Loudspeaker

1. 6” coaxial environmentally protected driver, 60-watt matching transformer, and deep volume dampened ABS enclosure with powder coated grille, designed for interior / exterior suspended installation. Speaker to include seismic rated hanging hardware.

2. Basis of Design / Exemplar Product

a. Tannoy OCV6
b. SoundTube RS600i

3. Acceptable Manufacturers:

a. Tannoy
b. SoundTube
c. Approved Equal

D. P6-03 – Standard 6” Grade Pendant Mount Loudspeaker

1. 6” bi-axial, environmentally protected driver, 60-watt matching transformer, and deep volume dampened ABS enclosure with powder

coated grille, designed for interior / exterior suspended installation. Speaker to include seismic rated hanging hardware.

2. Basis of Design / Exemplar Product

   a. OWI SAT360

3. Acceptable Manufacturers:

   a. Tannoy
   b. SoundTube
   c. OWI
   d. Approved Equal

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

B. Equipment Racks: All equipment must be permanently installed. Products and / or Equipment designed for installation into equipment racks must be installed and secured into a metal, EIA Standard rack as specified elsewhere in the Contract Documents.

1. Provide sufficient ventilation and mounting spacing for proper operation and cooling.
2. All cabling installed within Equipment Racks must be securely attached to the internal framework, cable lacing bars, and / or cable management products.
3. Equipment racks provided for the installation of audio / video system electronics shall provide a minimum of 42 rack units (RU's) of clear mounting space (UON).
4. Any unoccupied front rail vertical rack space is to be filled with appropriate blank and / or vent panels.
5. Secure Equipment Racks firmly to structure (unless specified as "on wheels"). Take all structural, seismic, and required work clearances into consideration when attaching to structure.

C. Wireless Operation: Systems with components that provide wireless operation (RF, IR, Wi-Fi) must be installed with required transmit / receive apparatus (antennas, IR sensors / emitters, Access Point) at a location where full functional operation of the wireless component of system operation can be achieved. Provide and install additional transmit / receive apparatus to provide additional coverage in areas with inadequate coverage, if a single transmit / receive apparatus fails to provide satisfactory operation.

D. Programming: Systems with components requiring software configuration and / or programming for complete and proper operation must be provided complete with required programming. Deliver to Owner latest copies of source code, licenses of required software, hardware soft-patch upgrades, firmware, security patches, manufacturer provided system configurators, soft terminals, middleware, interfaces, and / or compilers. Ownership of all intellectual property rights over final system programming and / or source code must be transferred to the Owner at the point of system Final Acceptance.

E. Analog Audio Distribution: Where unbalanced analog audio signals are required to be distributed or transported over copper cabling for distances exceeding 20', provide unbalanced-to-balanced impedance matching devices (BALUN's) or active distribution amplifiers to eliminate the potential of audible ground loops.

F. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

G. Uninterruptable Power Supplies (UPS): Provide UPS systems capable of 30 minutes continuous operation on branch circuit power feeding all low power draw equipment (<300VA) requiring extended power up / re-booting times. Audio power amplifiers / video projectors / video display devices are exempt from this requirement (unless required by local AHJ).

3.2 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SEISMIC REQUIREMENTS

A. In seismically active areas, provide the following:

1. Zone 2B or greater

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.

b. Provide rear support for mounted equipment weighing in excess of 10 lbs./RU, or where the equipment depth exceeds 3.0 times its height (in RU's).

2. Zone 3 or greater

a. Attach equipment racks securely to the floor using fasteners rated for the entire weight of rack assembly.
b. Provide rear support for mounted equipment weighing in excess of 5 lbs./RU, or where the equipment depth exceeds 2.5 times its height (in RU's).
c. Provide additional bracing to side walls. Side wall bracing to be installed at the top of each installed rack.

3.4 COORDINATION

A. Contractor must provide information, instruction, and manufacturer specific / specialty back boxes and / or other custom raceway material(s) to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment.

B. Reference Specification Section 27 0500 – Part 3 (Technology Systems - General Conditions) for additional coordination requirements.

3.5 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, "Good Workmanship in Electrical Construction" for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they

pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Cabling entering enclosures: Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12' AFF. Cabling may be installed free-run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12' AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

L. UTP Cabling:

1. CMR / CL2 / CL2R rated UTP Cabling installed concealed in walls, below raised floors, in soffits, or above inaccessible ceiling spaces shall be installed within metallic conduits (EMT). Provide plenum rated (CMP / CL2P) rated UTP cabling if free-run within these spaces.
2. UTP cabling installed above accessible ceilings may be installed free-run via cable supports / j-hooks attached to building structure in lieu of

raceways. Provide plenum rated (CMP / CL2P) where required by AHJ or local building codes.

3. Install cabling in neat and workmanlike manner. Neatly bundle and tie cables. Maintain EIA / TIA / BICSI recommended cable bend radius for each cable type installed. Do not untwist cable pairs more than 0.5 in. when terminating.
4. Fully terminate all conductors; no cable shall contain un-terminated conductors. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. UTP Cables may not be spliced.
6. Install cable without damaging conductors, shield, or jacket.
7. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.
8. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
    a. Pull cables simultaneously if more than one is being installed in the same raceway.
    b. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
    c. Use pulling means including fish tape, cable, rope, and basket-weave wire / cable grips that will not damage media or raceway.
9. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and / or terminals.
10. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
11. Install per NEC and Life Safety requirements.
12. Maintain proper clearances from EMI / RF noise sources.
13. Replace any cable exhibiting physical defects such as cuts, tears, or bulges.
14. Label each cable installed per ANSI / TIA / EIA-606-A/B requirements.
15. Firestop all openings where cabling is installed through a rated wall.

M. Outlet Jacks & Faceplates

1. Install Faceplates flush and square to mounting surface / outlet box.
2. Telecommunications Outlet boxes shall be secured to building with mechanical fasteners.

3. Modular Outlet Jacks shall be installed into matching Faceplates. Provide blank inserts for all empty / unused jack openings.

N. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48” cabling pre-termination loop at field devices (free run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18” cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.
3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

O. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.

P. Cable Identification: Each wire and / or cable installed must be permanently identified with legibly printed, unique cabling identification label. Cable Labeling must conform with the following:

1. Cabling Identification label must be mechanically printed. Handwritten cabling identification labels are not acceptable except for temporary identification during installation. Handwritten labels must be replaced with mechanically printed labels.
2. Cabling Identification labels must be affixed to each cable within 16” of termination.
3. Contractor to deliver a report of all cable identification numbers indicating the device each end is terminated to and cable type.

Q. Grounding: Take all necessary precautions to minimize electromagnetic and / or electrostatic interference. Grounding bars in equipment racks must be bonded to grounding bars in equipment rooms, IDF, and / or building ground system. Comply with NEC Article 250.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Prepare equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Submittals" Article.
    b. Verify operation of all system components. Test each input / output. Verify proper operation of systems possessing wireless communications / operation.
    c. Provide subjective listening tests of all Sound Systems across intended audience areas. Measure sound pressure levels utilizing a calibrated SPL meter, Real-Time-Analyzer, and TEF (Time / Energy / Frequency) FFT-Based measurement system.
    d. Verify speech intelligibility in FGM, PA, and SR covered spaces. Prepare a report of findings listing all unusual or unacceptable system performance
    e. Visually inspect the output / display of all Visual Display equipment. Verify good color balance by observing skin tones, primary colors, and blacks utilizing both static and motion images. Prepare a report of findings listing all unusual or unacceptable system performance.
    f. Verify operation of User Interface & Control System equipment.

3. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at three locations in each zone. Maximum permissible variation in level is plus or minus 3 dB; in levels between adjacent zones, plus or minus 5 dB.
4. Power Output Test: Measure electrical power output of each amplifier at normal gain settings of 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.
5. Signal Ground Test: Measure and report ground resistance at system signal ground. Comply with testing requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."
6. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
7. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

B. Audio / Visual / User Interface & Control systems will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 TRAINING

A. Reference Specification Section 27 0500-3.4 (Technology Systems - General Conditions) for specific system Training requirements.

END OF SECTION 274100

SECTION 28 1310 - ACCESS CONTROL / DURESS / DOOR MONITORING / INSTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. Contract Document drawings indicate general locations and quantities of the Access Control / Duress / Door Monitoring / Intrusion Detection system. The design documents are schematic in nature and for reference in understanding the design intent.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional requirements.

1.2 SUMMARY

A. The Access Control / Duress / Door Monitoring / Intrusion Detection system provided shall be an integrated, enterprise class, PC based, programmable monitoring, alarm, notification, and control system capable of reporting and control of door contacts and locking mechanisms; reading and determining access status of personnel via proximity card readers, keypads, magnetic strip card readers, RFID tags, and biometric recognition devices; detection of motion via CCTV cameras, ultrasonic and IR based motion detectors. The system shall manage and control devices such as door release strikes, magnetic door locks, CCTV camera positioning devices, video recording devices, driveway gate openers, roll-up door actuators, notification alarms, and remote paging and / or notification communication devices.

B. The Access Control / Duress / Door Monitoring / Intrusion Detection system shall be fully embedded within a Unified Security Platform (USP) by Genetech. The USP shall provide seamless unification of the Access Control / Door Monitoring / Intrusion Detection system with Network Video Management Software (NVMS) onto a single software interface.

C. The Unified Security Platform software shall be provided and installed onto dedicated PC Workstations where security monitoring positions / locations are noted in the drawings. A PC Workstation loaded with USP / NVMS software is required at each monitoring location as a part of this contract. At least one (1) monitoring location will be required as a part of this contract.

D. The system architecture used as the Basis of Design for this project will be structured around the Genetech Unified Security solution. Genetech Unified

Security shall be the Owner's sole source provider for access control solutions for this project.

E. All electronically locked / card-reader controlled doors in this project shall be provided with a mechanical release when in an exit path. They shall additionally be provided with fire alarm releases, motion sensors, and exit buttons (where required), and shall meet the requirements of the local authority having jurisdiction.

F. The Access Control / Duress / Door Monitoring / Intrusion Detection system shall be programmed to perform identification, screening, logic, and control functions as required making the system fully operational and customized to the Owner's needs and requirements in securing the intended buildings / spaces for multiple levels of credentials and / or security.

G. The Enrollment Center for this project is understood to be offsite at the the Owner's human resources facility. This access control system must be made compatible with Owner's existing access control credentialing cards. Bidders are instructed to investigate and coordinate current access control card requirements before submitting credential readers for acceptance.

H. Section Includes (but is not limited to):

1. A central Access Control workstation station / enrollment center with Unified Security Platform software installed.
2. One or more security access networked workstations with USP / NVMS licensed interface(s).
3. Security access operating system and application software and database(s).
4. Security access controllers connected to high-speed electronic-data transmission network.
5. Security access control door control panels.
6. Access control card readers, magnetic locks, door position monitoring contacts, local alarms, cabling, and other required system components.

I. The Genetech Unified Security System Integrator shall coordinate pre-bid with the Door / Door Hardware provider to assure no duplication of door locking scope or materials exist. If a duplication of door locking hardware is discovered post contract award, the Access Control – Duress – Door Monitoring System Integrator shall issue credits back to the Owner for the amounts representing this duplication of materials and installation labor.

1.3 DEFINITIONS

A. CCTV: Closed-circuit television.

B. CPU: Central processing unit.

C. Credential: Data assigned to an entity and used to identify that entity.

D. dpi: Dots per inch.

E. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

F. GFI: Ground fault interrupter.

G. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

H. I / O: Input / Output.

I. LAN: Local area network.

J. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

K. PC: Personal computer. Applies to the central station, workstations, and file servers.

L. PCI Bus: Peripheral Component Interconnect. A peripheral bus providing a high-speed data path between the CPU and the peripheral devices such as a monitor, disk drive, or network.

M. PDF: Portable Document Format. The file format used by the Acrobat document-exchange-system software from Adobe.

N. RAS: Remote access services.

O. RF: Radio frequency.

P. ROM: Read-only memory.

Q. TCP / IP: Transport control protocol / Internet protocol incorporated into Microsoft Windows.

R. TWAIN: A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

S. UPS: Uninterruptible power supply.

T. USP: Unified Security Platform – an enterprise class, integrated Access Control, Visual Surveillance, Door Monitoring, Intrusion Detection software security platform that provides seamless unification of Access Control with an IP video management system (VMS).

U. USB: Universal serial bus.

V. VMS: Video Management System – an enterprise class IP video management software solution.

W. WAN: Wide area network.

X. WAV: The digital audio format used in Microsoft Windows.

Y. WMP: Windows media player.

Z. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

AA. Windows: Operating system by Microsoft Corporation.

BB. Workstation: A PC with software that is configured for specific, limited security-system functions.

CC. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

B. Coordinate Access Control / Duress / Door Monitoring / Intrusion Detection system with work to be provided by Door Frame / Door Hardware provider to assure no scope of work / bill of materials duplications exist.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals must be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Manufacturer cut sheets to include information on rated capacities, performance characteristics, operational features, dimensions, weights, power requirements, heat release, furnished specialties, and / or accessories.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options must be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor must clearly indicate which model / type is being provided for each application.
2. Unless specifically requested, the Contractor shall not submit manufacturer product data in the form of owner's manuals, operations manuals, installation manuals, and / or non-English publications. Information received in this manner will be rejected and returned un-reviewed.
3. Owner's manuals, operations manuals, and installation manuals are a part of Closeout Documents requirements.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
   a. All critical system electronics shall be powered off UPS or DC battery backup.
   b. Equipment to be powered via UPS to include power supplies, door control panels, PoE injectors, DVR / NVR's, access control workstations, servers, media translators, etc.
   c. UPS / battery backup to be sized to power entire system for a minimum of six (6) hours upon loss of normal power where Access Control system is not provided emergency generator power.
   d. UPS / battery backup to be sized to power entire system for a minimum of 30 minutes upon loss on normal power where Access Control system is provided emergency generator power.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals shall be made in full compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

B. In addition to items specified in Specification Section 27 0500-1.6, include the following:

1. Microsoft Windows software documentation.
2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

C. Equipment List: Include major pieces of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset

positions, description of alarms, and description of unit output responses to an alarm.

D. Field quality-control reports.

E. Operation and Maintenance Data: For cameras, power supplies, monitors, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended being stored at the site for ready access.

F. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70, "National Electrical Code."

E. Comply with SIA DC-01, SIA DC-03, and SIA DC-07.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products and / or Equipment identified by the manufacturer’s name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C

of the Specification Section 27 0500 (Technology Systems – General Conditions).

C. Products and / or Equipment connected to the electrical system (branch circuit power) must be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where the Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors, provide all required items from a single manufacturer (i.e.: provide all proximity readers from a single manufacturer, UON).
3. Where the Contract Documents require materials of devices designed to be mounted within or as a sub-assembly of another product, provide all required items from a single manufacturer.
4. Where the Contract Documents require product that must form a rated, warranted system, provide all required items / components from a single manufacturer and provide written documentation of manufacturers required testing and warrantee.

E. Not every product listed in Part 2 of the Technology Specifications may be required by project design requirements. Reference floorplan drawings, one-line diagrams, schedules, drawing notes, and details in addition to Technology Systems specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed must bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide an integrated system with products by the following:

1. Genetech Unified Security
2. HID Global
3. Altronix
4. LifeSafety
5. Securitron
6. Schlage
7. Alarm Controls

2.3 ACCESS CONTROL SYSTEM:

A. Security Access System: PC-based central station, one or more networked PC-based workstations, and field-installed controllers, connected by a high-speed electronic-data transmission network.

B. System Software: Based on 64-bit, Windows 10 Professional (or newer): includes database, central-station, workstation, server, and application software. Software shall have the following capabilities:

1. Multiuser and multitasking to allow for independent activities and monitoring to occur simultaneously at different workstations.
2. Graphical user interface to show pull-down menus and a menu-tree format that complies with interface guidelines of Microsoft Windows.
3. System license for the entire system including capability for future additions that are within the indicated system size limits specified in this Section.
4. Open-architecture system that allows importing and exporting of data and interfacing with other systems that are compatible with Microsoft Windows.
5. Password-protected operator login and access.
6. Open-database-connectivity compliant.

C. Network connecting the central station and workstations shall be a LAN / WAN using Ethernet based TCP / IP with a capacity of connecting all required workstations. System shall be portable across multiple communication platforms without changing system software.

D. Network(s) connecting PCs and controllers shall consist of one or more of the following:

1. Local area, IEEE 802.3 100 / 1000 Mbit Ethernet.
2. Direct-connected, RS-232 cable from the COM port of the central station to the first controller, then RS-485 cable to interconnect the remaining controllers at that Location.

2.4 APPLICATION SOFTWARE

A. System Software: Based on 64-bit, Microsoft Windows 10 Professional central-station, workstation operating system, and application software.

B. Scalable, fully integrated security management suite providing database replication, fault tolerance, distributed SQL Server database architecture allowing for local, regional, and global server architecture with redundant failover protection.

C. Basis of Design:

1. Genetech Unified Security

2.5 CENTRAL-STATION HARDWARE

A. Central-Station Computer: Standard unmodified PC of modular design. The CPU shall be 64-bit, quad core; the CPU operating speed shall be at least 2.6 GHz.

1. Memory: 6 GB of usable installed RAM memory, expandable to a minimum of 24 GB without additional chassis or power supplies.
2. Power Supply: Minimum capacity of 250 W.
3. Serial Ports: Provide two TIA 232-F serial ports for general use, with additional ports as required. Data transmission rates shall be selectable under program control.
4. Universal Serial Bus (USB): Provide minimum four USB 2.0 ports.
5. LAN Adapter Card: 10 / 100 / 1000 Mbps internal network interface card.
6. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
7. LCD Color Monitor: Not less than 22 inches, with a minimum resolution of 1280 by 1024 pixels.
8. Keyboard: With a minimum of 64 characters, standard ASCII character set based on ANSI INCITS 154.
9. Mouse: Standard, compatible with the installed software.
10. Disk storage shall include the following, each with appropriate controller:
    a. Minimum 500 GB hard disk, RAID 1 array, maximum average access time of 7 ms.
11. Audible Alarm: Manufacturer's standard.
12. DVD+/- DVD-R / RW Drive:

B. UPS: Self-contained; complying with requirements in Division 26 Section "Static Uninterruptible Power Supply."

1. Size: Provide a minimum of six hours of operation of the central-station equipment, including two hours of alarm printer operation.
2. Batteries: Sealed, valve regulated, recombinant, lead calcium.
3. Accessories:

    a. Transient voltage suppression.
    b. Input-harmonics reduction.
    c. Rectifier / charger.
    d. Battery disconnect device.
    e. Static bypass transfer switch.
    f. Internal maintenance bypass / isolation switch.
    g. External maintenance bypass / isolation switch.
    h. Output isolation transformer.
    i. Remote UPS monitoring.
    j. Battery monitoring.
    k. Remote battery monitoring.

2.6 CONTROLLERS

A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the central station or workstation for controlling its operation.

B. Subject to compliance with requirements in this article, manufacturers may use multipurpose controllers.

C. Battery Backup: Sealed lead acid; when on emergency generator, sized to provide run time during a power outage of 90 minutes, complying with UL 924. When not on emergency generator power, sized to provide a minimum of 8 hours run time, complying with UL 924.

D. Alarm Annunciation Controller:

1. The controller shall automatically restore communication within 10 seconds after an interruption with the field device network, with dc line supervision on each of its alarm inputs.

a. Inputs: Monitor dry contacts for changes of state that reflect alarm conditions. Provides at least eight alarm inputs, which are suitable for wiring as normally open or normally closed contacts for alarm conditions.
b. Alarm-Line Supervision:

1) Supervise the alarm lines by monitoring each circuit for changes or disturbances in the signal, and for conditions as described in UL 1076 for line security equipment by monitoring for abnormal open, grounded, or shorted conditions using dc change measurements. System shall initiate an alarm in response to an abnormal current, which is a dc change of 10 percent or more for longer than 500 ms.
2) Transmit alarm-line-supervision alarm to the central station during the next interrogation cycle after the abnormal current condition.

c. Outputs: Managed by central-station software.

2. Auxiliary Equipment Power: A GFI service outlet inside the controller enclosure.

E. Door Controller:

1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes,

electric locksets, magnetic latches, gate and door operators, and exit push buttons.

a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.
b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:

1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.
2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.

c. Maintain a date, time, and location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

2. Inputs:

a. Data from entry-control credential reader devices; use this input to change modes between access and secure.
b. Database downloads and updates from the central station that include enrollment and privilege information.

3. Outputs:

a. Indicate success or failure of attempts to use entry-control devices and make comparisons of presented information with stored identification information.
b. Grant or deny entry by sending control signals to portal-control devices and mask intrusion-alarm annunciation from sensors stimulated by authorized entries.
c. Maintain a date-, time-, and Location-stamped record of each transaction and transmit transaction records to the central station.
d. Door Prop Alarm: If a portal is held open for longer than 20 seconds, an alarm will sound.

4. With power supplies sufficient to power at voltage and frequency required for field devices and portal-control devices.
5. Data Line Problems: For periods of loss of communication with the central station, or when data transmission is degraded and generating continuous checksum errors, the controller shall continue to control entry

by accepting identifying information, making authentication decisions, checking privileges, and controlling portal-control devices.

a. Store up to 1000 transactions during periods of communication loss between the controller and access-control devices for subsequent upload to the central station on restoration of communication.

6. Controller Power: NFPA 70, Class II power-supply transformer, with 12- or 24-V ac secondary, backup battery and charger per requirements set forth in the Low-Voltage Power Supplies section of this specification.

2.7 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.

B. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.

C. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

D. Display: Digital visual indicator shall provide visible and audible status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

E. Keypads:

1. Entry-control keypads shall use a unique combination of alphanumeric and other symbols as an Identifier.
2. Keypads shall contain an integral alphanumeric / special symbols keyboard with symbols arranged in ascending ASCII-code ordinal sequence / random scrambled order.
3. Communication protocol shall be compatible with the local processor.

F. Keypad Display:

1. Keypads shall include a digital visual indicator and shall provide visible and audible status indications and user prompts.
2. Display shall indicate power on or off and whether user passage requests have been accepted or rejected.
3. Design of the keypad display or keypad enclosure shall limit viewing angles of the keypad as follows:

    a. Maximum Horizontal Viewing Angle: Plus or minus 25 degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display.
    b. Maximum Vertical Viewing Angle: Plus or minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.

G. Keypad Duress Codes:

1. Keypads shall provide a means for users to indicate a duress situation by entering a special code.

2.8 ENROLLMENT CENTER

A. The Enrollment Center for this project is understood to be offsite at the the Owner's human resources facility. This access control system must be made compatible with Owner's existing access control credentialing cards. Bidders are instructed to investigate and coordinate current access control card requirements before submitting credential readers for acceptance.

2.9 EGRESS BUTTON SWITCHES (Door Release)

A. Push Button Switches: Momentary-contact back-lighted push buttons with stainless-steel switch enclosures.

B. Mushroom Button: Provide Push-Button Switches designed for request-to-exit egress door opening applications with a 2" minimum diameter Mushroom Button head. Mushroom Button to be RED in color and bear inscription "PUSH TO EXIT" or equivalent (in local language / braille as required).

C. Electrical Ratings:

1. Minimum continuous current rating of 10 A at 120-VAC or 5 A at 240-VAC.
2. Contacts that will make 720 VA at 60 A and break at 720 VA at 10 A.

D. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.

E. Basis of Design Product:

1. Schlage Locknetics 620 Series.

2. Alarms Controls Corp TS-2-2

2.10 CREDENTIAL READER / CARD READER – PROXIMITY CARD - HID (CR)

A. Credential Readers / Card Readers for this project shall be proximity card credential readers capable of reading HID proximity, CASSI ProxLite, AWID, and ISO ProxLite, proximity cards, key fobs, and tags.

B. Credential Readers / Card Readers shall support 125 kHz operation. Supports contactless read distances up to 4”.

C. Credential Readers / Card Readers shall support output formats of Wiegand and RS-232 communications.

D. Dual-input Credential Readers provide both proximity card scanning and numeric keypad entry for applications where advanced screening is required.

E. Select specific model based upon mounting conditions. Provide full size reader where possible. Provide narrow / mullion mount readers where horizontal space, door frame mounting is required. Provide supplementary mounting support assemblies such as pedestals, wall mount arms, bollards, pole support brackets where required.

F. Basis of Design Products:

1. HID MiniProx 5365 / 5368 (mullion mount prox)
2. HID Thinline II 5395 / 5398 (single-gang prox)
3. HID ProxPro 5355 / 5352 / 5358 (single-gang prox)
4. HID ProxPro w / Keypad 5355 / 5352 / 5358 (single-gang prox / keypad)
5. HID MaxiProx 5375 (long range prox reader – vehicular parking)

2.11 VEHICLE-MOUNT PROXIMITY CREDENTIAL TAG

A. Vehicle-mount Proximity Credential Tags shall be fully compatible with specified Access Control / Duress / Door Monitoring system defined in this section. .

B. Vehicle-mount Proximity Credential Tags support contactless read distances up to six feet.

C. Vehicle-mount Proximity Credential Tags must be compatible with vehicular entry readers and all HID card formats.

D. Dual-input Credential Readers provide both proximity card scanning and numeric keypad entry for applications where advanced screening is required.

E. Select specific model based upon mounting conditions. Provide full size reader where possible. Provide narrow / mullion mount readers where horizontal space, door frame mounting is required. Provide supplementary mounting support

assemblies such as pedestals, wall mount arms, bollards, pole support brackets where required.

F. Basis of Design Products:

1. HID ProxPass II Active Tag (vehicle proximity credential tag)

2.12 ELECTRIC DOOR STRIKE (ES)

A. Access Control – Duress – Door Monitoring – Intrusion Detection System Integrator shall coordinate pre-bid with the Door / Door Hardware provider to assure no duplication of scope or materials exist. If a duplication of door locking hardware is discovered, the Access Control – Duress – Door Monitoring – Intrusion Detection System Integrator shall credit back to the Owner for the amounts representing this duplication of materials and installation labor.

B. Electric Door Strikes are recessed or surface door frame mounted, electronically operated, door locking / securing apparatus to be used as a part of a larger Access Control / Duress / Door Monitoring System.

C. Electric Door Strikes are to be used on doors with standard door latch hardware where the means of egress are via mechanical actuation of the door lockset. Electric Strikes may be used in conjunction with traditional brass key locksets.

D. Electric Door Strikes shall be fail secure, 24 VDC operated. They shall be duty rated for static strength of minimum 1,500 lbs, dynamic strength of minimum 70 ft / lbs.

E. Basis of Design Product:

1. Folger Adams Model 310-2 ¾ (standard doors)
2. Folger Adams Model 310-3-1 (doors w / deadbolt)

F. Coordinate Electric Door Strikes with the requirements of Division 8. Assure no duplication of materials / scope of work exists before procuring, providing, and / or installing this product.

2.13 ELECTRIC LOCKSET (EL)

A. Electric Locksets are electronic door locking devices mortised within door panels. Electric Locksets are, typically provided installed by the door supplier and are not included in the section unless there is found to be a gap in materials.

B. Access Control System Integrator shall coordinate pre-bid with the Door / Door Hardware provider to assure no duplication or gap of scope or materials exist. If a duplication of door locking hardware is discovered,

the Access Control System Integrator shall credit back to the Owner the amounts representing this duplication of materials and installation labor.

2.14 DOOR CONTACT (DC)

A. Door Contact as a part of an Access Control, Door Monitoring, or Intrusion Detection System shall be concealed, wide-gap type, magnetically operated SPDT reed style switches compatible with the door frame and type.

B. Door Contacts are typically included and custom fabricated into the door frames / doors by the provider of the door hardware for this project. Where Door Contacts are required but not provided within the door / frame assembly before the installation of the door, consideration for surface mount Door Contacts on the secure side of door may be given.

C. Coordinate Door Contacts with the requirements of Division 8. Assure no duplication of materials / scope of work exists before procuring, providing, and / or installing this product.

2.15 MAGNETIC LOCK (MAG)

A. Access Control – Duress – Door Monitoring – Intrusion Detection System Integrator shall coordinate pre-bid with the Door / Door Hardware provider to assure no duplication of scope or materials exist. If a duplication of door locking hardware is discovered, the Access Control – Duress – Door Monitoring – Intrusion Detection System Integrator shall credit back to the Owner for the amounts representing this duplication of materials and installation labor.

2.16 CABLES

A. General Cable Requirements: Comply with fully with the Access Control / Duress / Door Monitoring system equipment manufacturer's cabling recommendations.

B. PVC-Jacketed, TIA 232-F Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum-foil / polyester-tape shielded pairs with 100 percent shield coverage; PVC jacket.
2. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
3. NFPA 70, Type CM.
4. Flame Resistance: UL 1581 vertical tray.

C. Plenum-Type, TIA 232-F Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum-foil / polyester-tape shielded pairs with 100 percent shield coverage; plastic jacket.
2. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
3. NFPA 70, Type CMP.
4. Flame Resistance: NFPA 262 flame test.

D. PVC-Jacketed, TIA 485-A Cables:

1. Two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

E. Plenum-Type, TIA 485-A Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

F. Multi-conductor, PVC, Reader and Wiegand Keypad Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil / polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

G. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil / polyester-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

H. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil / polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.

2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

I. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil / polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

J. Multi-conductor, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil / polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

K. Paired, Electric Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

L. Paired, Plenum-Type, Electric Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

M. Paired, Electric Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

N. Paired, Plenum-Type, Electric Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.

2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

O. Paired, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum-foil / polyester-tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMR.
3. Flame Resistance: UL 1666 riser flame test.

P. Paired, Plenum-Type, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum-foil / polyester-tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

Q. Paired, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.

R. Paired, Plenum-Type, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

S. LAN / Ethernet Cabling:

1. Comply with requirements in Division 27 Section "Communications Copper Cabling" (Section 27 1513) and Division 28 Section “Conductors and Cables for Electronic Safety and Security.”
2. NFPA 262.

2.17 LOW-VOLTAGE POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of control panels, door locking hardware, credential readers, and accessories, and of type and quantity as recommended by manufacturer(s).

B. DC output low-voltage power supplies shall be provisioned with internal battery backup, sized to be capable of operating all connected devices for a minimum of 120 minutes. Low-voltage power supply shall contain integrated battery charger.

C. Backup Battery: Valve-regulated, recombinant-sealed, lead-acid battery; spill proof. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.

D. Individually power-limited / fused / circuit breaker outputs for each connected device.

1. Typical Supply Single Device Output: 12 VDC / 24 VAC, 30VA
2. Heavy Duty Supply Single Device Output: 12 VDC / 24 VAC, 100 VA
3. Thermal protection circuitry
4. Provide 25% extra spare fuses for fused models

E. Must be UL / CE Listed.

F. Low-voltage power supplies Basis of Design Product:

a. LifeSafety FPO 75 / 150 / 250 Series
b. Altronix Maxim / Maximal 77 / 77D Series
c. Securitron BPS-24-10

2.18 TRANSFORMERS

A. NFPA 70, Class II control transformers, UL / CE listed (as applicable to the AHJ). Transformers for security access-control system shall not be shared with any other system.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

B. The Contractor is responsible for providing a complete and functioning system including all necessary shop design, installation, programming, testing, and materials.

C. The Contractor shall perform the installation following all applicable codes and manufacturer’s recommendations.

D. The installation shall be done in a neat and workman like manner.

E. The Contractor shall patch, repair, and / or paint any damaged sheetrock or other building surfaces.

F. The contractor shall properly seal all fire-wall and non-fire-wall penetrations. The contractor shall perform all wiring and terminations per the NEC requirements. Unless

otherwise indicated, the Contractor shall install all wires and cables in an appropriate raceway.

G. The Contractor shall vacuum and clean all work areas daily. The Contractor shall return all ceiling tiles to their proper location when leaving an area. Conduit shall be used in areas where wire or cable protection is required.

H. Wireless Operation: Systems with components that provide wireless operation (RF, IR, WiFi) must be installed with their transmit / receive apparatus (antennas, IR sensors / emitters, Access Point) at a location where full functional operation of the wireless component of system operation can be achieved. Provide and install additional transmit / receive apparatus to provide additional coverage in areas with inadequate coverage, if a single transmit / receive apparatus fails to provide satisfactory operation.

I. Software / Applications: Systems with components requiring software configuration and / or programming for complete and proper operation must be provided complete with required programming. Deliver to Owner latest copies of source code, licenses of required software, hardware soft-patch upgrades, firmware, security patches, manufacturer provided system configurators, soft terminals, middleware, interfaces, and / or compilers. Ownership of all intellectual property rights over final system programming and / or source code must be transferred to the Owner at the point of system Final Acceptance.

J. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

K. Uninterruptable Power Supplies (UPS): Provide UPS systems capable of a minimum of 30 minutes continuous operation on branch circuit power feeding all low power draw equipment (<300VA) requiring extended power up / re-booting times.

1. UPS / battery backup to be sized to power entire system for a minimum of six (6) hours upon loss of normal power where Access Control system is not provided emergency generator power.
2. UPS / battery backup to be sized to power entire system for a minimum of 30 minutes upon loss on normal power where Access Control system is provided emergency generator power.

3.2 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, “Good Workmanship in Electrical Construction” for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12’ AFF. Cabling may be installed free-run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12’ AFF.

I. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.
2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

J. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

L. Install plenum rated cable in environmental air spaces, including ceiling plenums.

3.3 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA / EIA 606-A/B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.

8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents. Include system schematics and Technical Drawings in electronic format.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.5 SYSTEM OPERATION

A. Security access system shall use a single database for access-control and credential-creation functions.

B. Distributed Processing: A fully distributed processing system.

1. Access-control information, including time, date, valid codes, access levels, and similar data, shall be downloaded to controllers so each controller can make access-control decisions.
2. Intermediate controllers for access control are prohibited.
3. In the event that communications with the central controller are lost, controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the central station.

C. System Network Requirements:

1. System components shall be interconnected and shall provide automatic communication of status changes, commands, field-initiated interrupts, and other communications required for proper system operation.
2. Communication shall not require operator initiation or response and shall return to normal after partial- or total-network interruption such as power loss or transient upset.
3. System shall automatically annunciate communication failures to the operator and shall identify the communications link that has experienced a partial or total failure.
4. Communications controller may be used as an interface between the central-station display systems and the field device network. Communications controller shall provide functions required to attain the specified network communications performance.

D. Central station shall provide operator interface, interaction, display, control, and dynamic and real-time monitoring. Central station shall control system networks to interconnect all system components, including workstations and field-installed controllers.

E. Field equipment shall include controllers, sensors, and controls.

1. Controllers shall serve as an interface between the central station and sensors and controls.
2. Data exchange between the central station and the controllers shall include down-line transmission of commands, software, and databases to controllers.
3. The up-line data exchange from the controller to the central station shall include status data such as intrusion alarms, status reports, and entry-control records.
4. Controllers are classified as alarm-annunciation or entry-control type.

F. System Response to Alarms:

1. Field device network shall provide a system end-to-end response time of two second(s) or less for every device connected to the system.
2. Alarms shall be annunciated at the central station within one second of the alarm occurring at a controller or at a device controlled by a local controller, and within 100 ms if the alarm occurs at the central station.
3. Alarm and status changes shall be displayed within 100 ms after receipt of data by the central station.
4. All graphics shall be displayed, including graphics-generated map displays, on the console monitor within five seconds of alarm receipt at the security console.
5. This response time shall be maintained during system heavy load.

G. False-Alarm Reduction: The design of the central station and controllers shall contain features to reduce false alarms. Equipment and software shall comply with SIA CP-01.

H. Data Line Supervision: System shall initiate an alarm in response to opening, closing, shorting, or grounding of data transmission lines.

I. Door Hardware Interface:

1. Comply with requirements in Division 08 Sections for door hardware required to be monitored or controlled by the security access system.
2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

3.6 APPLICATION SOFTWARE

A. System Software: Based on the Genetch 64-bit, Microsoft Windows 10 Professional central-station and workstation operating system and application software.

1. Multiuser multitasking shall allow independent activities and monitoring to occur simultaneously at different workstations.
2. Graphical user interface shall show pull-down menus and a menu-tree format.
3. Capability for future additions within the indicated system size limits.
4. Open architecture that allows importing and exporting of data and interfacing with other systems that are compatible with operating system.
5. Password-protected operator login and access.

B. Workstation Software:

1. Password levels shall be individually customized at each workstation to allow or disallow operator access to program functions for each Location.
2. Workstation event filtering shall allow user to define events and alarms that will be displayed at each workstation. If an alarm is unacknowledged (not handled by another workstation) for a preset amount of time, the alarm will automatically appear on the filtered workstation.

C. Database Downloads:

1. All data transmissions from PCs to a Location, and between controllers at a Location, shall include a complete database checksum to check the integrity of the transmission. If the data checksum does not match, a full data download shall be automatically retransmitted.
2. If a controller is reset for any reason, it shall automatically request and receive a database download from the PC. The download shall restore data stored at the controller to their normal working state and shall take place with no operator intervention.
3. Software shall provide for setting downloads via dial-up connection to once per 24-hour period, with time selected by the operator.
4. Software shall provide for setting delays of database downloads for dial-up connections. Delays change the download from immediately to a delay ranging from one to 999 minutes.

D. Alarm Monitoring: Monitor sensors, controllers, and DTS circuits and notify operators of an alarm condition. Display higher-priority alarms first and, within alarm priorities, display the oldest unacknowledged alarm first. Operator acknowledgment of one alarm shall not be considered acknowledgment of other alarms nor shall it inhibit reporting of subsequent alarms.

1. Displayed alarm data shall include type of alarm, location of alarm, and secondary alarm messages.

2. Printed alarm data shall include type of alarm, location of alarm, date and time (to nearest second) of occurrence, and operator responses.
3. Maps shall automatically display the alarm condition for each input assigned to that map if that option is selected for that input location.
4. Alarms initiate a status of "pending" and require the following two handling steps by operators:

    a. First Operator Step: "Acknowledged." This action shall silence sounds associated with the alarm. The alarm remains in the system "Acknowledged" but "Un-Resolved."
    b. Second Operator Step: Operators enter the resolution or operator comment, giving the disposition of the alarm event. The alarm shall then clear.

5. Each workstation shall display the total pending alarms and total unresolved alarms.
6. Each alarm point shall be programmable to disallow the resolution of alarms until the alarm point has returned to its normal state.
7. Alarms shall transmit to the central station in real time except for allowing connection time for dial-up locations.
8. Alarms shall be displayed and managed from a minimum of four different windows.

    a. Input Status Window: Overlay status icon with a large red blinking icon. Selecting the icon will acknowledge the alarm.
    b. History Log Transaction Window: Display name, time, and date in red text. Selecting red text will acknowledge the alarm.
    c. Alarm Log Transaction Window: Display name, time, and date in red. Selecting red text will acknowledge the alarm.
    d. Graphic Map Display: Display a steady colored icon representing each alarm input location. Change icon to flashing red when the alarm occurs. Change icon from flashing red to steady red when the alarm is acknowledged.

9. Once an alarm is acknowledged, the operator shall be prompted to enter comments about the nature of the alarm and actions taken. Operator's comments may be manually entered or selected from a programmed predefined list, or a combination of both.
10. For locations where there are regular alarm occurrences, provide programmed comments. Selecting that comment shall clear the alarm.
11. The time and name of the operator who acknowledged and resolved the alarm shall be recorded in the database.
12. Identical alarms from the same alarm point shall be acknowledged at the same time the operator acknowledges the first alarm. Identical alarms shall be resolved when the first alarm is resolved.
13. Alarm functions shall have priority over downloading, retrieving, and updating database from workstations and controllers.

14. When a reader-controlled output (relay) is opened, the corresponding alarm point shall be automatically bypassed.

E. Visitor Assignment:

1. Provide for and allow an operator to be restricted to only working with visitors. The visitor badging subsystem shall assign credentials and enroll visitors. Allow only those access levels that have been designated as approved for visitors.
2. Provide an automated log of visitor name, time and doors accessed, and name of person contacted.
3. Allow a visitor designation to be assigned to a credential holder.
4. Security access system shall be able to restrict the access levels that may be assigned to credentials issued to visitors.
5. Allow operator to recall visitors' credential-holder file once a visitor is enrolled in the system.
6. The operator may designate any reader as one that deactivates the credential after use at that reader. The history log shall show the return of the credential.
7. System shall have the ability to use the visitor designation in searches and reports. Reports shall be able to print all or any visitor activity.

F. Training Software: Enables operators to practice system operation, including alarm acknowledgment, alarm assessment, response force deployment, and response force communications. System shall continue normal operation during training exercises and shall terminate exercises when an alarm signal is received at the console.

3.7 DOOR AND GATE HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm and annunciate a local alarm (where indicated in the Drawings). Exit device and alarm contacts are specified in Division 08 Section "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Division 08 Section "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Division 08 Section "Door Hardware."

D. Electromagnetic Locks: End-of-line resistors shall provide power-line supervision. Lock status sensing signal shall positively indicate door is secure. Power and signal shall be from the controller. Electromagnetic locks are specified in Division 08 Section "Door Hardware."

E. Vehicle Gate Operator: Interface electrical operation of gate with controls in this Section. Vehicle gate operators shall be connected, monitored, and controlled by the security access controllers. Vehicle gate and accessories are specified in Division 32 Section "Chain Link Fences and Gates."

3.8 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Division 28 Section "Conductors and Cables for Electronic Safety and Security."

C. All Access Control / Duress / Door Monitoring / Intrusion Detection cabling must be installed protected from tampering / vandalism / public view. System cabling installed lower than 12’ AFF must be protected from access / tampering by installation through conduits, raceways, cable trays, within enclosed wall cavities, or above finished ceilings.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

E. Wiring Method: Install all system wiring in raceways and / or cable trays except within consoles, cabinets, desks, and counters. Cabling may be installed free-run in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

F. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and fiber-optic rating of components, and that ensure Category 6 and fiber-optic performance of completed and linked signal paths, end to end.

G. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

H. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48” cabling pre-termination loop at field devices (free run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18” cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.

3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

I. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.

J. Cabling entering enclosures: Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

K. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.9 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits." as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-

alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

3.10 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft.

E. Card Readers and Keypads:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft..
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 ft. (75 m).

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. (8 m).

3.11 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.12 INSTALLATION

A. Push Buttons: Where multiple push buttons are housed within a single switch enclosure, they shall be stacked vertically with each push-button switch labeled with 1 / 4-inch- high text and symbols as required. Push-button switches shall be connected to the controller associated with the portal to which they are applied, and shall operate the appropriate electric strike, electric bolt, or other facility release device.

3.13 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and with TIA / EIA 606-A/B.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.14 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software licenses / intellectual property rights to Owner.

3.15 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA / EIA 568-B.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA / EIA 568-B.1.
2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.16 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.17 PROTECTION

A. Maintain strict security during the installation of equipment and software.

B. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.18 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain security access system. See Division 01 Section "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

END OF SECTION 28 1310

SECTION 28 2300 - VISUAL SURVEILLANCE SYSTEM (VSS – CCTV)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section as if they were a part of this section.

B. Contract Document drawings indicate general locations and quantities of the Visual Surveillance System (VSS). The design documents are for general guidance and reference in understanding the design intent. Exact routing, placement, distances, elevations, and orientation of the Visual Surveillance System components will be determined by Interior Design, Civil, and Structural engineering design documents, as well as field conditions.

C. Reference Specification Section 27 0500 (Technology Systems - General Conditions) for additional requirements.

D. Coordinate the requirements of this system with those listed systems in 27 0500-1.1.D.

1.2 SUMMARY (IP VSS System)

A. The Visual Surveillance System (VSS) provided shall contain professional quality, IP mega-pixel color cameras. IP CCTV cameras be color, low light performance, Ethernet output cameras with built-in video analytics, with a minimum resolution of 2.1 mega-pixels.

B. The output of all VSS cameras will be transported via Ethernet UTP, and / or optical fiber cabling to Network Video Recorders (NVR's). Image storage will be accomplished via multi-terabyte, Western Digital Purple Class, RAID-1 configured, NVR's.

C. The Visual Surveillance System will consist of, but is not limited to, the following components and equipment.

1. Hi-Resolution IP color day / night CCTV cameras and their associated lenses, housings, cabling, and mounting brackets / kits / devices.
2. Pan-Tilt-Zoom positioning devices
3. PTZ Controllers
4. Network Video Recorders (NVR)
5. Security Observation Workstations
6. Enterprise Class Video Management Software (VMS)
7. Control Client Monitoring Software
8. Video Analytics Software / Processors

9. Video System / Network Controllers
10. Layer 2 / 3 Network Switches
11. 802.11g Wireless Transceivers
12. TVSS Protection Equipment
13. Equipment Racks, Housings, Power Distribution
14. Power Supplies, Cabling, and Hardware
15. Uninterruptible Power Supplies (UPS)

D. Each Visual Surveillance System shall be provided with at least one (1) Security Observation Workstation (VSS Monitoring Location). If no Security Observation Workstations are identified on the floor plan drawings, the Security Observation Workstation location should be assumed to be TBD / by Owner. Where the VSS Workstation is “by Owner” the installer shall provide licenses, programming, and video management software required to enable Owner’s workstation to function as a required VSS Observation Workstation.

E. Each Security Observation Workstation location shall be provided with a VSS Observation Workstation, VSS Monitors, PTZ Controllers (if PTZ cameras are required), Control Client Monitoring Software, TVSS Protection Equipment, UPS power, monitor / display mounting brackets, power supplies, and / or other supplies necessary for proper operation, but not specifically mentioned.

F. Visual Surveillance System shall be integrated with door monitoring and access control system specified in Division 28 Section 28 1310 - “Access Control / Duress / Door Monitoring" which further specifies specific system integration.

G. The Visual Surveillance System shall be fully embedded within a Unified Security Platform (USP). The USP shall provide seamless unification of the Access Control / Door Monitoring / Intrusion Detection system with an IP Video Management system onto a single software interface.

H. The Unified Security Platform software shall be provided and installed onto dedicated PC Workstations where security monitoring positions / locations are noted in the drawings. A PC Workstation loaded with USP software is required at each monitoring location as a part of this contract. A minimum of one (1) monitoring location will be required as a part of this contract.

I. Furnish, deliver, and install the VSS complete and operational. Provide, install, and program the VSS to project & Owner requirements. Include any miscellaneous materials, parts, and / or supplies necessary for proper operation, but not specifically mentioned. Provide all labor, materials, licenses, and supervision to test, adjust, and calibrate the system to industry standards and the Owner’s requirements.

1.3 DEFINITIONS

A. AGC: Automatic Gain Control

B. BNC: Bayonet style video connector

C. B/W: Black and White

D. CCD: Charge-Coupled Device

E. FTP: File Transfer Protocol

F. FPS: Frames per Second

G. IP: Internet Protocol

H. IPS: Images per Second

I. IR: Infrared

J. LAN: Local Area Network

K. MPEG: Moving Picture Experts Group

L. MPx: Mega Pixel

M. NTSC: National Television System Committee

N. PC: Personal Computer

O. PTZ: Pan-Tilt-Zoom

P. RAID: Redundant Array of Independent Disks

Q. TCP: Transmission Control Protocol - connects hosts on the Internet

R. TVL: Television Lines

S. UDP: User Datagram Protocol

T. UPS: Uninterruptible power supply

U. USP: Unified Security Platform (software)

V. VMS: Video Management Software (enterprise class)

W. WAN: Wide area network

1.4 PROPOSAL TENDER

A. Reference Specification Section 27 0500-1.4 (Technology Systems - General Conditions) for specific proposal tender requirements.

1.5 SUBMITTALS

A. Submittals are required before the commencement of work. Submittals must be made in compliance with Specification Section 27 0500-1.5 (Technology Systems - General Conditions).

B. Product Data: For each required product type provided in Part 2 - Products. Manufacturer cut sheets to include information on rated capacities, performance characteristics, operational features, dimensions, weights, power requirements, heat release, furnished specialties, and / or accessories.

1. Manufacturer Cut Sheets containing multiple models, sizes, colors, voltages, and / or other options must be clearly marked to indicate the exact model, size, color, voltage, and / or options being provided. If more than one model number or product type is illustrated in the manufacturer's product data sheet(s), Contractor must clearly indicate which model / type is being provided for each application.
2. Unless specifically requested, the Contractor shall not submit manufacturer product data in the form of owner's manuals, operations manuals, installation manuals, and / or non-English publications. Information received in this manner will be rejected and returned un-reviewed.
3. Owner's manuals, operations manuals, and installation manuals are a part of Closeout Documents requirements.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
   a. All critical system electronics shall be powered off UPS or DC battery backup.
   b. Equipment to be powered via UPS to include camera power supplies, network switches, PoE injectors, DVR / NVR's, security workstations, and surveillance monitors, media translators, etc.

D. Equipment Lists: Include major pieces of equipment by model number, manufacturer, and line item pricing.

1.6 CLOSEOUT DOCUMENTS

A. Closeout Document Submittals are required at the time of system final inspection and before final acceptance. Closeout Document Submittals shall be made in full compliance with Specification Section 27 0500-1.6 (Technology Systems - General Conditions).

B. In addition to items specified in Specification Section 27 0500-1.6, include the following:

1. Microsoft Windows software documentation.
2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

C. Field quality-control reports.

D. Equipment List: Include major pieces of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

E. Operation and Maintenance Data: For cameras, power supplies, monitors, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended being stored at the site for ready access.

F. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

A. Methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to generally accepted industry best practices. Equipment and materials must be of the quality and manufacture indicated. Equipment specified is based on the most recent products of the acceptable manufacturers listed. Where “Approved Equal” is stated, equipment must be equivalent to that of the equipment specified and must be submitted for approvals.

B. Materials and work specified herein must comply with the applicable requirements of the following

1. Americans with Disabilities Act (ADA)
2. NFPA 70 (latest edition adopted by AHJ)
3. NEMA 250

C. Technology Systems Installers tendering proposals for work defined in this and related sections, must meet the qualifications listed in Specification Section 27 0500-1.9 (Technology Systems – General Conditions).

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85° F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122° F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122° F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 12 enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122° F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 4X enclosures.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.10 COORDINATION

A. Video System Installer shall provide direction and any special backboxes or material to raceway installer. Coordination between trades shall be conducted prior to the installation of any materials or equipment. Coordination shall insure that a complete and functional Visual Surveillance System is provided to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products and / or Equipment identified by the manufacturer’s name and / or model number are specifically listed to assist in the understanding of design intent. Make and model of devices identified are exemplary of acceptable products. Equipment proposed and submitted by Contractor must meet the features and requirements set forth in this specification.

B. Products and / or Equipment provided must be new, in good condition, and suitable for the intended purpose. Products are to be provided from reputable, industry known manufacturers with a recognized track record of quality. Products and / or Equipment must conform to applicable codes and industry standards. A listing of publications and standards can be found in Section 1.1.C of the Specification Section 27 0500 (Technology Systems – General Conditions).

C. Products and / or Equipment connected to the electrical system (branch circuit power) must be provided with the same ratings as the local utility (both voltage and frequency).

D. Product Uniformity:

1. Where the Contract Documents require multiple quantities of a single product type, provide all required items from a single manufacturer, single model.
2. Where the Contract Documents require multiple quantities of a single product type, but multiple models / sizes / colors, provide all required items from a single manufacturer (i.e.: provide all cameras from a single manufacturer, UON).
3. Where the Contract Documents require materials of devices designed to be mounted within or as a sub-assembly of another product, provide all required items from a single manufacturer.
4. Where the Contract Documents require product that must form a rated, warranted system, provide all required items / components from a single manufacturer and provide written documentation of manufacturers required testing and warrantee.

E. Not every product listed in Part 2 of the Technology Specifications may be required by project design requirements. Reference floorplan drawings, one-line diagrams, schedules, and details in addition to Technology Systems specifications for the complete design intent.

F. Products and / or Equipment required by the AHJ to be UL listed must bear the UL logo.

G. Products, Equipment and / or hardware not specifically identified in the Contract Documents, but deem necessary for the proper installation, function, and / or operation of the system must be furnished and installed.

H. Substitutions: Reference Section 27 0500-2.2 for substitution submittal requirements.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Pelco
2. Avigilon
3. Axis
4. Cisco
5. Panasonic
6. Siemens
7. Samsung
8. SmarterCam
9. Altronix

10. 360Vision
11. Approved Equal.

B. IP Video - signal format shall comply with 16:9 wide screen display monitor video formats. Cameras shall provide a minimum resolution of 2.1 MP (1920p x 1080p)

C. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

2.3 CAMERAS - GENERAL

A. *Camera models listed in this Section are referenced by alphanumeric designations. Manufacturer and models listed in this section are offered to communicate design intent. Products listed in each section are approved models. Alternates will be evaluated for approval upon receipt of required submittals*

B. *Camera models specified below are to communicate design intent and are referenced in both Specifications and Contract Drawings by coded reference. The coded reference contains information on; a) the camera construction / type (XXX), and b) the quality level of the required product (ZZ). A guide to interpreting and understanding the coded references follows:*

XXXX-ZZ

C. *XXXX refers to camera construction / installation configuration.*

1. *BIR color BULLET ANALOG cameras with integrated IR illumination*
2. *BIP color BULLET IP cameras with integrated IR illumination*
3. *CAS color ANALOG STANDARD BOX varifocal cameras*
4. *CADI color indoor ANALOG cameras with integrated DOME*
5. *CADE color exterior ANALOG cameras with integrated DOME*
6. *CIPS color IP STANDARD BOX varifocal cameras*
7. *CIPD color IP integrated DOME varifocal fixed cameras*
8. *IPTZ color IP integrated PTZ DOME cameras*
9. *PTZ color ANALOG BOX cameras mounted on PTZ drive*
10. *PTZD color ANALOG cameras with integrated PTZ DOME*
11. *PTZX explosion-proof color ANALOG BOX cameras with PTZ drive*
12. *TIF fixed mount thermal imaging cameras*
13. *TIPT thermal imaging cameras with integrated pan-tilt drive*
14. *TIPF thermal imaging IP cameras with integrated pan-tilt drive*

D. *ZZ refers to the quality level / specific model of the required camera.*

1. *Reference specific sections below for additional information on these requirements. Quality designations vary by camera construction / installation configuration.*

2.4 NETWORK CAMERAS (IP)

A. Network (IP) cameras below are referenced by alphanumeric designations. Manufacturer and models listed in this section are offered to communicate design intent. Products listed in each section are approved models. Alternates will be evaluated for approval upon proper submittal of products.

B. All Network (IP) cameras for this project to be capable of the following:

1. Capable of multiple simultaneous video streams.
2. Capable of multiple / adaptive frame rates up to and including 30 IPS.
3. Video compression must include H.264, MPEG, and Motion JPEG.
4. Must support the following network protocols:

    a. IEEE 802.3af (PoE)
    b. TCP / IP
    c. UDP / IP
    d. IGMP
    e. UPnP
    f. DNS
    g. DHCP
    h. IPv4
    i. IPv6
    j. HTTP
    k. FTP
    l. SNMP
    m. SMTP
    n. QoS
    o. SSL

5. Provide the ability to control the camera and monitor video via standard web browser over a single IP connection.
6. ONVIF conformant.

C. CIPS-03 – 2.1 MPx IP Color Box Camera:

1. 2.1 MPx IP Color Box Camera s contain the following features;

    a. Pickup Device: 1/3” CMOS Progressive Scan
    b. Aspect Ratio: 4:3 / 16:9
    c. Resolution: 2.1 MPx (1980x1080)
    d. Sensitivity (33 ms): ≤ 0.50 lux
    e. Day / Night Operation: Mechanical IR Filter
    f. Lens: CS Mount
    g. Signal-to-Noise Ratio: ≥ 50 dB (AGC Off)
    h. Other Features:

        1) DC Drive Auto-iris
        2) Local Storage (via microSD)
        3) Advanced Video Analytics

4) Wide Dynamic Range
5) Privacy zones

2. Basis of Design Product:

a. 2.1 MPx - Pelco Sarix IXE20 Series

D. CIPS-04 – 3.1 MPx IP Color Box Camera:

1. 3.1 MPx IP Color Box Cameras contain the following features;

a. Pickup Device: 1/3” CMOS Progressive Scan
b. Aspect Ratio: 4:3 / 16:9
c. Resolution: 3.1 MPx (2048x1536)
d. Sensitivity (33 ms): ≤ 0.55 lux
e. Day / Night Operation: Mechanical IR Filter
f. Lens: CS Mount
g. Signal-to-Noise Ratio: ≥ 50 dB (AGC Off)
h. Other Features:

1) DC Drive Auto-iris
2) Local Storage (via microSD)
3) Video Analytics
a) Camera Sabotage
b) Adaptive Motion
c) Window Blanking
4) Wide Dynamic Range
5) Privacy zones

2. Basis of Design Product:

a. 3.1 MPx - Pelco Sarix IX30-IP Series

E. CIPD-03 – 2.1 / 3.0 MPx IP Color Fixed Mini-Dome Camera:

1. 2.1 / 3.0 MPx IP Color Fixed Cameras contain the following features;

a. Pickup Device: 1/3” CMOS Progressive Scan
b. Aspect Ratio: 4:3 / 16:9
c. Resolution: 2.1 MPx (1920x1080)
d. Resolution: 3.0 MPx (2048x1536)
e. Sensitivity (33 ms): ≤ 0.15 lux
f. Day / Night Operation: Mechanical IR Filter
g. Lens: Integrated varifocal (3-9mm, 9-22mm)
h. Signal-to-Noise Ratio: ≥ 50 dB (AGC Off)
i. Other Features:
1) Local Storage (via microSD)
2) Video Analytics
a) Camera Sabotage
b) Adaptive Motion
c) Window Blanking
3) Wide Dynamic Range

4) Privacy zones

2. Basis of Design Product:

a. 0.5 MPx - Pelco Sarix IES0 Series

F. CIPD-05 – 2.1 MPx IP Color HD Dome Camera:

1. 2.1 MPx IP Color HD Cameras contain the following features;

a. Pickup Device: 1/3” CMOS Progressive Scan
b. Aspect Ratio: 4:3 / 16:9
c. Resolution: 2.1 MPx (1920x1080)
d. Sensitivity (33 ms): ≤ 0.55 lux
e. Day / Night Operation: Mechanical IR Filter
f. Lens: Integrated varifocal (3-9mm, 9-22mm)
g. Signal-to-Noise Ratio: ≥ 50 dB (AGC Off)
h. Other Features:

1) DC Drive Auto-iris
2) Local Storage (via microSD)
3) Advanced Video Analytics
4) Wide Dynamic Range
5) Privacy zones

2. Basis of Design Products:

a. 2.1 MPx - Pelco Sarix IEE20 Series
b. 2.1 MPx – Cisco 6020-IP Series

G. CIPD-06 – 3.1 MPx IP Color HD Dome Camera:

1. 3.1 MPx IP Color HD Cameras contain the following features;

a. Pickup Device: 1/3” CMOS Progressive Scan
b. Aspect Ratio: 4:3 / 16:9
c. Resolution: 3.1 MPx (2048x1536)
d. Sensitivity (33 ms): ≤ 0.55 lux
e. Day / Night Operation: Mechanical IR Filter
f. Lens: Integrated varifocal (3-9mm, 9-22mm)
g. Signal-to-Noise Ratio: ≥ 50 dB (AGC Off)
h. Other Features:

1) DC Drive Auto-iris
2) Local Storage (via microSD)
3) Video Analytics
a) Camera Sabotage
b) Adaptive Motion
c) Window Blanking
4) Wide Dynamic Range
5) Privacy zones

2. Basis of Design Product:

a. 3.1 MPx - Pelco Sarix IE30 Series

2.5 LENSES

A. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Lenses selected must be appropriate for indoor and outdoor lighting conditions. Provide auto-iris, spot filter, color-corrected lenses for each color camera provided.

B. Lenses shall be individually selected for each camera where camera / lens assembly does not come as a manufactured unit. Verify focal length of each lens can attain specified horizontal field of view from camera mounting position.

C. Apertures: Provide highest quality lens with largest aperture available for each application. Where varifocal lens is provided, the following shall be the minimum f/ stop rating of required lens:

1. Lenses ≤ f/1.0 for focal lengths < 1.6 mm.
2. Lenses ≤ f/1.2 for focal lengths 1.6 – 3.0 mm.
3. Lenses ≤ f/1.4 for focal lengths 3.1 – 6.0 mm.
4. Lenses ≤ f/1.6 for focal lengths 6.1 – 10.0 mm.
5. Lenses ≤ f/1.8 for focal lengths 10.1 – 40.0 mm.
6. Lenses ≤ f/2.0 for focal lengths 40.0 and up.

D. Varifocal Lenses: Provide all varifocal lenses with direct DC-drive auto-iris and included spot filter.

E. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video light level in varying lighting conditions.

1. Auto-Iris lenses shall be provided with standard square 4-pin plug compatible with DC drive circuitry on camera to be installed.
2. Provide IR Corrected series auto-iris lenses on all cameras specified as Day / Night operation.
3. Spot-filter required for all exterior installed lenses.

F. MegaPixel IP Camera Lenses: Provide specially designed MegaPixel rated lenses for IP cameras 2.1 MPx and above.

G. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:

1. Electrical Leads: Filtered to minimize video signal interference.
2. Motor Speed: Variable.
3. Lens shall be available with preset positioning capability to recall the position of specific scenes.

H. Acceptable Manufacturers:

1. Same Manufacturer as Camera
2. Recommended by Manufacturer of Camera

2.6 VIDEO SIGNAL CABLE (UTP / IP)

A. When used for the transport of IP video (or analog video with active / passive baluns), UTP Video Signal Cabling shall be provided with the following required characteristics:

1. Conductors: 4 twisted pairs, 100% solid copper, #23AWG or #24AWG
2. Shield: None
3. Outer Jacket: Acceptable to AHJ for this specific installation
4. Nominal Impedance: 100 ohms
5. Nominal DC Resistance: ≤ 26 Ω / 1000 ft. (#24 AWG)

B. Construction & Use (passive balun pairs – video signal only):

1. CAT-3: #24 AWG / multi-pair UTP – permitted for signal runs up to 400 ft.
2. CAT-5: #24 AWG / 4 or 25-pair UTP – permitted for signal runs up to 650 ft.
3. CAT-5e: #24 AWG / 4-pair UTP – permitted for signal runs up to 750 ft.
4. CAT-6: #23 AWG / 4-pair UTP – permitted for signal runs up to 800 ft.

C. Construction & Use (active transceiver pairs – video signal only):

1. CAT-3: #24 AWG / multi-pair UTP – permitted for signal runs up to 1,500 ft.
2. CAT-5: #24 AWG / 4 or 25-pair UTP – permitted for signal runs up to 2,500 ft.
3. CAT-5e: #24 AWG / 4-pair UTP – permitted for signal runs up to 3,000 ft.
4. CAT-6: #23 AWG / 4-pair UTP – permitted for signal runs up to 4,000 ft.

D. When UTP Cabling is used for the transport of the video output from IP cameras (TCP / UDP streaming), UTP Cabling shall also comply with requirements of Section 27-1510 - Communications Copper Cabling.

E. Provide all CCTV / VSS UTP cabling with a unique outer jacket color from voice, data, and / or other UTP cabling used on this project.

F. Acceptable Manufacturers:

1. West-Penn Wire
2. CommScope
3. Superior Essex
4. Belden
5. Approved Equal

2.7 VSS POWER CABLE (camera power, enclosure conditioning)

A. VSS camera low-voltage power cabling shall be unshielded, jacketed, twisted pair with the following required characteristics:

1. Conductors: 2-conductor, #18 AWG (minimum) twisted-pair
2. Shield: None required
3. Outer Jacket: Acceptable to AHJ for specific installation conditions
4. Nominal DC Resistance: ≤ 5.9 Ω / 1000 ft. (#18AWG / 2-cond)

B. Construction &Use:

1. 24 VAC outputs, 10 VA load
    a. #18AWG / 2-cond: cable runs up to 450 ft. (28 VAC / 600 ft.)
    b. #16AWG / 2-cond: cable runs up to 700 ft. (28 VAC / 975 ft.)
    c. #14AWG / 2-cond: cable runs up to 1,100 ft. (28 VAC / 1,550 ft.)
2. 24 VAC outputs, 20 VA load
    a. #18AWG / 2-cond: cable runs up to 225 ft. (28 VAC / 300 ft.)
    b. #16AWG / 2-cond: cable runs up to 360 ft. (28 VAC / 475 ft.)
    c. #14AWG / 2-cond: cable runs up to 550 ft. (28 VAC / 750 ft.)
3. 24 VAC outputs, 30 VA load
    a. #18AWG / 2-cond: cable runs up to 150 ft. (28 VAC / 200 ft.)
    b. #16AWG / 2-cond: cable runs up to 240 ft. (28 VAC / 320 ft.)
    c. #14AWG / 2-cond: cable runs up to 375 ft. (28 VAC / 500 ft.)
4. 24 VAC outputs, 50 VA load
    a. #18AWG / 2-cond: cable runs up to 90 ft. (28 VAC / 125 ft.)
    b. #16AWG / 2-cond: cable runs up to 140 ft. (28 VAC / 200 ft.)
    c. #14AWG / 2-cond: cable runs up to 220 ft. (28 VAC / 320 ft.)

C. Acceptable Manufacturers:
1. West-Penn Wire
2. CommScope
3. Superior Essex
4. Belden
5. Approved Equal

2.8 CAMERA SUPPORTS

A. Mounting Brackets for Fixed Cameras: Provide type and quantity matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

B. Protective Housings for Fixed and Movable Cameras: Powder-coated aluminum and / or stainless-steel enclosures with internal camera mounting and electrical connection provisions that are matched to camera / lens combination and mounting and installing arrangement of camera to be housed.
1. Camera Viewing Window: Polycarbonate / glass window, aligned with camera lens.
2. Duplex Receptacle: Internally mounted (if required).
3. Alignment Provisions: Camera mounting / housing shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
4. Exterior Enclosures: Built-in, thermostat-activated heater / blower / defrosting units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded. Shall be IP-66 rated.
5. Sun shield shall not interfere with normal airflow around the housing.
6. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be non-corrosive.

7. Finish: Housings and mounting brackets shall be factory finished using manufacturer's standard finishing process suitable for the environment.

C. Acceptable Manufacturers:

1. Same Manufacturer as Camera
2. Recommended by Manufacturer of Camera

2.9 VSS MONITORS

A. VSS Monitors shall be driven by a Security Observation Workstation / VSS Observation Workstation. Reference VSS Observation Workstation section this specification for additional requirements.

B. VSS Monitors shall be high quality, color LCD flat panel displays with a native aspect ratio that matches the aspect ratio of the greatest number of installed cameras. VSS Monitors shall be designed for continuous 24 / 7 display.

C. VSS Monitors shall possess the following features, at a minimum:

1. LED backlit.
2. Input connectors: DB-15 SVGA, HDMI, and / or DVI.
3. *BNC input / loop-through outputs (where indicated)*

D. Pixel resolution of VSS Monitors to be utilized for multiplexed images shall be 2560 x 1440 minimum. Pixel resolution of VSS Spot Monitors must be 1920 x 1080 minimum. Viewing angle specified to be 160° or greater.

E. Each VSS Observation Workstation must be provisioned with one (1) Multiplexed Image Monitor and one (1) Spot Monitor (minimum) at the primary observation workstation. One monitor will be dedicated to the simultaneous display of multiple multiplexed CCTV camera images. The Spot Monitor will be dedicated for the viewing of single / selected cameras and / or alarm call up display.

F. Minimum size for the VSS Spot Monitor shall be 20” diagonal (unless otherwise specified in design drawings). Minimum size for the Multiplexed Image Monitor(s) shall be 27” diagonal (unless otherwise specified in design drawings).

G. Each VSS Multiplexed Image Monitor will display a maximum of 16 multiplexed images per display. Monitors of nine (9) or four (4) images per display shall be acceptable. Multiplexed Image Monitors must support Picture-In-Picture (PIP). Provide sufficient quantity multiplexed monitors to view all installed cameras.

H. Provide one Spot Monitor minimum per observation staff position.

I. Provide VSS Monitors with integrated speakers where audio monitoring / intercom functions are required.

J. Acceptable Manufacturers:

1. Samsung
2. NEC
3. ASUS
4. HP

K. Basis of Design Product (spot monitor):

1. Pelco PMCL400 Series

2.10 VSS OBSERVATION WORKSTATION

A. VSS Observation Workstations shall consist of a standard unmodified PC with accessories and peripherals that configure the workstation for this specific duty.

B. VSS Observation Workstation provided shall be provided with Unified Security Platform / Video Management Software installed, complete with required licenses assigned to the Owner.

C. Each VSS Observation Workstation must be provisioned with one (1) Multiplexed Image Monitor and one (1) Spot Monitor (minimum) at the primary observation workstation. One monitor will be dedicated to the simultaneous display of multiple multiplexed CCTV camera images. The Spot Monitor will be dedicated for the viewing of single / selected cameras and / or alarm call up display.

D. Minimum size for the VSS Spot Monitor shall be 20” diagonal (unless otherwise specified in design drawings). Minimum size for the Multiplexed Image Monitor(s) shall be 27” diagonal (unless otherwise specified in design drawings).

E. Workstation Computer: Standard unmodified PC of modular design. The CPU shall be 64-bit, quad core; the CPU operating speed shall be at least 2.0 GHz.

1. Memory: 16 GB of usable installed RAM memory, expandable to a minimum of 32 GB without additional chassis or power supplies.
2. System Software: Based on 64-bit, Windows 10 Professional.
3. Power Supply: Minimum capacity of 450 W.
4. Serial Ports: Provide two TIA 232-F serial ports for general use, with additional ports as required. Data transmission rates shall be selectable under program control.
5. Universal Serial Bus (USB): Provide minimum four (4) USB 3.0 ports.
6. LAN Adapter Card: 1 GBps internal network interface card.
7. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
8. LCD Color Monitors: Reference VSS Monitor Section above.
9. Keyboard: Standard ASCII character set based on ANSI INCITS 154.
10. Mouse: Standard, compatible with the installed software.
11. Disk storage shall include the following, each with appropriate controller:

    a. Minimum 1TB hard disk, RAID 1 array, maximum average access time of 7 ms.

F. UPS: Self-contained, complying with requirements in Division 26 Section "Static Uninterruptible Power Supply."

1. Size: Provide a minimum of six hours of operation of the central-station equipment, including two hours of alarm printer operation.
2. Batteries: Sealed, valve regulated, recombinant, lead calcium.
3. Accessories:

a. Transient voltage suppression.
b. Input-harmonics reduction.
c. Rectifier / charger.
d. Battery disconnect device.
e. Static bypass transfer switch.
f. Internal maintenance bypass / isolation switch.
g. External maintenance bypass / isolation switch.
h. Output isolation transformer.
i. Remote UPS monitoring.
j. Battery monitoring.
k. UPS operation monitoring.
l. Abnormal operation. Visible and audible indication.
m. Remote battery monitoring.

2.11 NETWORK VIDEO RECORDER (NVR):

A. Network Video Recorders (NVR) shall be stand-alone, networked, storage servers optimized for the digitized video output of CCTV cameras. Network Video Recorders shall be able to be configured into a flexible, decentralized, open architecture, Visual Surveillance System comprised of a mix of analog and IP cameras, network and attached encoders, client workstations, video decoders, and observation stations.

B. Network Video Recorders shall feature an open architecture through ONVIF compliance to support a wide range of manufacturers IP cameras and encoders. Approved NVR's offer a combined throughput of 280 Mbps (recording, live view, and client image recall).

C. Network Video Recorders feature network health and event monitoring through SNMP and SMTP reporting.

D. Retrieval and viewing of stored video shall be made possible through the following:

1. On-board Video Management Software (VMS)
2. Remote client workstations provided with VMS
3. Network Video Decoder appliances

E. Network Video Recorders shall be capable of the following connectivity:

1. 128 combined IP and Analog Cameras (camera bandwidth dependent)
2. 64 Analog Cameras (through direct attached encoders)
3. Dual Gigabit Ethernet RJ-45 (1000Base-T)
4. Dual HDMI video outputs
5. Four (4) external analog camera encoder ports
6. Three (3) USB 2.0 ports
7. Two (2) USB 3.0 ports
8. Audio output

F. Provide Network Video Recorders with the following features as a minimum:

1. Storage: 4TB minimum (capable of up to 18 TB internal, 24 TB external RAID 5)
2. Processor: Intel Core i7 (2nd gen)
3. Operating System: Microsoft Windows 10 (64-bit, Ultimate)
4. RAM: 8GB
5. Direct Attached Encoders: support all installed analog cameras +20% future.

6. Recording Resolution: H.264, MJPEG, and MPEG-4 IP Streams, native IP camera resolution, 720p minimum for encoded analog camera streams, all cameras.
7. Recording Storage Time: 30 days minimum
8. Image Recording: variable IPS / FPS per camera (15 IPS minimum), min of 240 Mbps.
9. Pentaplex Operation: NVR must be capable of the following simultaneous operations;
    a. Recording – all cameras, both analog & IP
    b. Live View – local & remote, all cameras
    c. Search / Playback – local search & playback of stored video
    d. Network – remote video search & playback (min of five concurrent users)
    e. Image Storage / Backup – video burning to USB / DVD
10. Workstation Client Software: Video Management Software provided at no additional cost.
11. Mounting: Standard 19-inch rack, or freestanding desktop.

G. Basis of Design Product:
    1. Pelco Digital Sentry DSSVR Series Network Video Recorders

2.12 LOW-VOLTAGE POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories and of type as recommended by manufacturer of camera and lenses.

B. DC output low-voltage power supplies shall be provisioned with internal standby batteries sized to be capable of operating all connected devices for a minimum of 120 minutes. Low-voltage power supply shall contain integrated battery charger.

C. Individually power-limited / fused / circuit breaker outputs for each connected camera / device.
    1. Typical Supply Single Device Output: 12 VDC / 24 VAC, 30VA
    2. Heavy Duty Supply Single Device Output: 12 VDC / 24 VAC, 100 VA
    3. Thermal protection circuitry
    4. Provide 25% extra spare fuses for fused models

D. Must be UL / CE Listed.

E. Basis of Design Product:
    a. Pelco MCS Series Power Supply
    b. Pelco WCS Series Power Supply
    c. Altronix Maximal 75 / 77

F. Basis of Design Product (PoE Camera Injectors):
    a. Altronix NetWay 8 / 16M Midspan Injectors

2.13 EQUIPMENT RACKS

A. Reference Specification Sections 27 1100 (Communications Equipment Room Fittings and Section 27 1118 (Equipment Racks) for project requirements.

2.14 TRANSFORMERS

A. NFPA 70, Class II control transformers, UL / CE listed (as applicable to the AHJ). Transformers for security / access-control system shall not be shared with any other system.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

A. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for expanded General Conditions and work requirements.

B. The Contractors or subcontractors' main resources within the project shall carry proper professional certification issued by the manufacturer and verified by a third-party organization to confirm sufficient product and technology knowledge

C. Wireless Operation: Systems with components that provide wireless operation (RF, IR, Wi-Fi) must be installed with its transmit / receive apparatus (antennas, IR sensors / emitters, Access Point) at a location where full functional operation of the wireless component of system operation can be achieved. Provide and install additional transmit / receive apparatus to provide additional coverage in areas with inadequate coverage, if a single transmit / receive apparatus fails to provide satisfactory operation.

D. Programming: Systems with components requiring software configuration and / or programming for complete and proper operation must be provided complete with required programming. Deliver to Owner latest copies of source code, licenses of required software, hardware soft-patch upgrades, firmware, security patches, manufacturer provided system configurators, soft terminals, middleware, interfaces, and / or compilers. Ownership of all intellectual property rights over final system programming and / or source code must be transferred to the Owner at the point of system Final Acceptance.

E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

F. Uninterruptable Power Supplies (UPS): Provide UPS systems capable of a minimum of 30 minutes continuous operation on branch circuit power feeding all low power draw equipment (<300VA) requiring extended power up / re-booting times.

1. UPS / battery backup to be sized to power entire system for a minimum of six (6) hours upon loss of normal power where VSS system is not provided emergency generator power.
2. UPS / battery backup to be sized to power entire system for a minimum of 30 minutes upon loss on normal power where VSS system is provided emergency generator power.

3.2 EXAMINATION

A. Examine all pathway elements intended for the installation of system cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to cabling installation, and other conditions affecting installation.

B. Examine all equipment installation locations. Verify sufficient work clearances, branch circuit power, cooling, and / or mounting support exists to allow for the successful installation of complete and operational systems. Install equipment only into secure, clean, and conditioned environment.

C. Verify all required LAN / WAN data network elements required for the proper operation of the VSS are in place and functional. Coordinate installation with facility network administrator.

D. Alert the General Contractor, Architect, and Engineer in writing upon discovery of any conditions that may prevent the successful and timely implementation of the work. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Reference Specification Section 27 0500 (Technology Systems - General Conditions), Part 3, for additional project Execution requirements.

3.3 WIRING METHODS / INSTALLATION

A. Comply with NECA 1, “Good Workmanship in Electrical Construction” for the installation of raceways and cabling.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Cable Ratings: Any installed wire or cable not entirely contained within conduits and / or raceways, and installed free-run through an air return plenum space, must be provided as plenum rated, end-to-end. Any installed wire or cable not entirely contained within conduits and / or raceways, and found traversing through telecom terminations spaces and / or floor-to-floor within a building, must be provided as riser rated, end-to-end. Cable substitutions may be made in accordance with NEC Article 725.

D. Install all system cabling complete and unspliced. Terminate all conductors to approved, industry standard terminations per cabling type.

E. Under no circumstances shall staples, metal saddles, or metallic wire clamps be used to support low voltage cabling from structure. Metal tie-wraps may be used to attach cable bundles to support members / J-hooks in rated ceilings where required by code as long as the tie-wrap does not compress the cabling jacket.

F. Where low voltage cabling must pass through a finished ceiling, provide cabling sleeves / pathways rated to match the ceiling membrane through which they pass. Cabling sleeves / pathways must be securely mounted to structure and sized to minimum NEC fill ratios + 25% for future growth. Firestop cable sleeves / pathways per code requirements.

G. Cabling entering enclosures: Install grommets / cabling protection assemblies where free-run cabling enters a metallic or non-metallic enclosure, cabinet, wireway, trough, or junction box. Install plastic bushings on all low voltage cable carrying conduits / raceways terminating into metallic or non-metallic enclosures, cabinets, wireways, troughs, or junction boxes.

H. Conceal conductors and cables hidden from view above accessible ceilings, within walls, and under raised floors. Cabling associated with or supporting security systems (Visual Surveillance, Access Control, Duress, Door Monitoring, Intercommunications, and Intrusion Detection) must be installed fully protected from tampering / vandalism / public view. Cabling must be protected by raceways / conduits where installed exposed below 12' AFF. Cabling may be installed free run (where acceptable to the AHJ and where appropriately rated cable is used) within enclosed walls, above finished ceilings, within totally enclosed cabinets and / or enclosures, and / or when installed greater than 12' AFF.

I. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

J. Wiring Method: Install all system wiring in raceways and / or cable trays except within consoles, cabinets, desks, and counters. Cabling may be installed free-run in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

K. Wiring within Wall Partitions: Where cabling is installed free-run within wall partitions, cabling must be rated to match partition rating.

1. If wall is constructed of wooden structural elements, low voltage cabling must be protected with steel nail guards across notches / drilled opening carrying free-run cables, both sides of stud.

2. If wall is constructed of steel structural elements, low voltage cabling must be protected with approved plastic bushings at each vertical / horizontal steel stud low voltage cabling passes through.

L. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

M. Install UTP cabling required by this section with a unique outer jacket color. Do not connect any VSS / CCTV cabling transporting analog video / control signals to any Ethernet network wall plate jacks, patch panels, switches, or other active network electronics.

N. Pre-Termination Cabling Service Loops (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 48" cabling pre-termination loop at field devices (free run cabling, no service box).
2. Box Mounted Jack Plates: Provide a minimum 18" cabling pre-termination loop at field devices / wall plates provided with a service / mounting box.

3. Equipment Racks: Provide a minimum 96” cabling pre-termination loop within equipment racks.
4. Wall Fields: Provide a minimum 120” cabling pre-termination loop at cabling wall field locations

O. Cabling Service Loops at Terminations (unless noted elsewhere):

1. Direct Cabled Field Devices: Provide a minimum 36” post-termination cabling service loop at field devices (free run cabling, no service box). Neatly bundle and hide service loop from public view after termination.
2. Box Mounted Jack Plates: Provide a minimum 12” post-termination cabling service loop within service / mounting box.
3. Rack Mounted Equipment: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations.
4. Wall Field Terminations: Provide a minimum 48” post-termination cabling service / termination loop at terminations within equipment racks and / or wall field locations

3.4 VISUAL SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras level and plumb.

B. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Provide video ground loop elimination transformers and / or video signal amplifiers as required to provide a system free of any ground loop roll bars, noise, interference, and / or other distortion.

F. Install and configure Video Management Software (client interface) on all Owner requested surveillance workstations.

G. Identify and label system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems."

3.5 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware for the complete and proper operation of systems involved. Assign software licenses / intellectual property rights to Owner.

B. All software shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the video management software.

C. All equipment requiring users to log on using a password shall be configured with user / site-specific password / passwords. No system / product default passwords shall be allowed to remain.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
    a. Prepare equipment list described in "Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

C. Visual Surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A A complete microprocessor controlled analog addressable, intelligent fire detection system. The equipment shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, annunciators, auxiliary control devices, power supplies, wiring and conduit.

1.02 SCOPE

A All of the products described by this section shall be manufactured by a single U.S. manufacturer and furnished by the manufacturer or authorized representative.

B The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the system integrity.

C The Drawings are schematic in nature. The manufacturer's listed device spacing requirements and applicable code requirements shall be maintained at all times.

1.03 CODES AND STANDARDS

A The fire alarm system specified in this section shall be in accordance with the National Fire alarm Code (NFPA 72), the National Electrical Code (NFPA 70) and the Life Safety Code (NFPA 101).

B The fire alarm system and installation shall comply with provisions of UL safety standards pertaining to fire alarm systems. All products and components shall be UL listed and/or labeled.

1.04 SUBMITTALS

A General: Submittals shall be in accordance with Specification Section 01 33 00.

B Submittals should include technical product data including specifications and installation instructions for each type of component, control panel elevations, system point-to-point wiring diagrams, termination details, and battery capacity calculations.

C Submittals shall include sufficient information to determine compliance with Drawings and specifications.

D All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards. For equipment other than that specified, the Contractor shall supply proof that substitute equipment equals or exceeds the standards of the specified equipment.

E Submit a software copy of all point-to-point wiring diagrams on a CD in 'DXF' or latest AutoCAD version format.

1.05 MANUALS

A Complete operating and maintenance manuals shall be submitted with the shop Drawings.

B Manuals shall include wiring diagrams indicating internal wiring for each component and the interconnections between components.

1.06 DELIVERY, STORAGE AND HANDLING

A Handle fire alarm equipment carefully to prevent damage, breaking, and scoring. Do not install damaged equipment or components.

B Store fire alarm equipment in a clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage.

1.07 QUALITY ASSURANCE

A The vendor of the system shall currently maintain a locally run business for a minimum of five years and shall be an authorized distributor of the supplied equipment with full warranty privileges.

B The vendor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the equipment manufacturer to maintain and service the equipment being supplied. This facility shall be available for inspection by the Architect's Engineer.

C The supplying vendor shall have attended the manufacturer's installation and service school.

D The vendor shall furnish manufacturer's manuals of the completed system including individual specification sheets, schematics, inter-panel and intra-panel wiring diagrams. In addition, all information necessary for the proper operation of the system must be included. Any bidder using other than the specified equipment must provide this information prior to bidding.

E As built Drawings that include any changes to wiring, wiring designations, junction box labeling and any other pertinent information shall be supplied upon completion of Project.

1.08 TRAINING

A Contractor shall make arrangement for training and shall ensure that the manufacturer's authorized representative shall furnish training for a minimum of three of the Owner's designated employees. This instruction shall include two (2) copies of a written, bound summary for future reference.

B The training shall include the following:

1. Training in receipt, handling, and acknowledgement of alarms.
2. Training in system operation including manual control of output functions from the control panel.
3. Training in testing of the system including logging of detector sensitivity, walk test of devices, and response to common troubles.
4. Training in all required periodic maintenance.

C The total training requirement shall be a minimum of 8 hours, but shall be sufficient to cover all items specified.

D The training may be waived, deleted, or reduced in the number of required hours only with the Owner's written approval.

1.09 WARRANTY

A All equipment and devices furnished and all work performed shall be free from defects and shall remain so for a period of at least one year from the date of Substantial Completion.

B Warranty hours shall be from 8 AM to 5 PM, Monday through Friday.

C The Owner shall not be held responsible for the cost of labor and materials required to correct any defect during this one-year period.

D The Owner shall not be held responsible for the cost of materials required to correct defects outside of the warranty hours.

E The fire alarm system vendor shall respond to all service calls within a minimum of 4 hours.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIAL – GENERAL

A All equipment and components shall be new and the manufacturer's current model. The devices, components, appliances and equipment shall be tested and listed by a nationally recognized approval agency for use as part of a protected premise protective signaling system.

B All equipment and components shall be installed in accordance with the manufacturer's recommendations.

2.02 CONDUIT AND WIRE

A Conduit

1. Conduit shall be installed and sized in accordance with the National Electrical Code (NEC), state and local requirements.
2. All wiring shall be installed in conduit or raceway
3. Conduit shall be ½" minimum.

B Wire

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with the NEC, state and local codes and as recommended by the fire alarm system manufacturer. Number and size of conductors shall be as recommended by the system manufacturer, but shall not be less than 18 AWG for initiating device circuits and signaling line circuits, and 14 AWG for notification appliance circuits.
3. All wire and cable shall be listed and approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit, wire and cable shall have a fire resistance rating suitable for the installation as indicated in the NEC. However, wire and cable shall be installed in conduit to the greatest extent possible.

2.03 FIRE ALARM CONTROL PANEL

A. The Fire Alarm Control Panel (FACP) shall be a nominal 24VDC, microprocessor (CPU) based, non-coded, supervised, analog intelligent, addressable, modular system. The FACP shall include a full-featured operator interface.

B. The FACP shall perform the following functions:

5. Supervise and monitor all intelligent addressable detectors and monitor modules for normal, trouble, and alarm conditions.
6. Supervise all initiating, signaling, and notification circuits.
7. Detect the activation of any initiating device and the location of the alarm condition.
8. Operate all notification appliances and auxiliary devices as programmed.
9. Visually and audibly annunciate any trouble, supervisory, or alarm condition on operator's terminals, panel display, and annunciators.

C The FACP shall be able to provide the following features:

1. Block Acknowledge for trouble conditions
2. Automatic Day/Night Sensitivity Adjustment
3. Environmental Drift Compensation
4. Pre-Alarm Indication at FACP
5. Smoke Detector Sensitivity Test
6. System Status Reports
7. Alarm Verification
8. Multiple Printer Interface
9. Multiple CRT Display Interface
10. Automatic Detector Test
11. Upload/Download of System Database
12. One-Man Walk Test
13. Smoke Detector Maintenance Alert
14. Multi-Level Password Entry
15. Device Blink Control

D The Central Processing Unit shall provide the following features:

1. Communicate with and control intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system-controlled devices.
2. Communicate with, monitor and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display.
3. Contain and execute all control-by-event (including ANDing, ORing, and NOTing) programs for specific action to be taken if an alarm condition is detected.
4. Provide a real-time clock for time annotation of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
5. Continuously scan peripheral devices for proper operation.

E The operator's interface shall include the following features:

1. An alphanumeric keypad capable of controlling all system functions, entry of any alphanumeric information, and field programming.
2. An 80-character backlit alphanumeric Liquid Crystal Display that displays, as required, custom labels for all intelligent detectors, addressable modules, and software zones.
3. Five LED's indicating the system status parameters AC Power, System Alarm, System Trouble, Display Trouble, and Signal Silence
4. Operator control switches for Signal Silence, Lamp Test, Reset, System Trouble, and Acknowledge.

F Loop Interface Board

1. Loop Interface Boards shall be provided to monitor and control each of the Signaling Line Circuit (SLC) Loops in the system. The Loop Interface Board shall contain its own microprocessor, and shall be capable of operating in Local Mode in the case of a failure in the Main CPU of the Control Panel. In Local Mode, The Loop Interface Board shall detect alarms and activate output devices on its own SLC loop.
2. The Loop Interface Board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations.
3. The Loop Interface Board shall provide power to, and communicate with, all of the Intelligent/Addressable Detectors and Addressable Modules connected to its SLC Loop over a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4, Style 6, or Style 7.
4. The Loop Interface Board shall be able to drive two Style 4 runs of these SLC Loops, each up to 10,000 feet in length, for an effective Loop span of 20,000 feet.
5. The Loop Interface Board shall receive analog information from all Intelligent Detectors and shall process this information to determine whether normal, alarm, or trouble

conditions exist for that particular detector. The Loop Interface Board software shall include software to automatically adjust and compensate for dust accumulation to maintain detector performance as it is affected by environmental factors. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

6. The Loop Interface Board shall communicate with each Intelligent/Addressable Detector and Addressable Module on its SLC loop and verify proper device function and status. Communication shall be performed every 6 seconds or less. Average time to detect an alarm shall be 3 seconds (longer for detectors utilizing alarm verification).

G Serial Interface Board

1. The Serial Interface Board shall provide the EIA-232 interface between the Fire Alarm Control Panel and the UL Listed Electronic Data Processing (EDP) Peripherals.
2. The Serial Interface Board shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports.
3. The Serial Interface Board shall provide one EIA-485 port for the serial connection of the optional Annunciator and Control Subsystem components.
4. The Serial Interface Board shall have LED's which will show that it is in regular communication with the Annunciators or other EIA485 connected peripheral device.
5. All EIA-232 circuits shall be optically isolated and power limited.

H Field Wiring Terminal Blocks

1. All wiring terminal blocks shall be the plug-in type and have sufficient capacity for 18 to 12 AWG wire. Fixed terminal blocks are not acceptable.

I Field Programming

1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
2. All programming shall be accomplished through the standard FACP keyboard.
3. All field-defined programs shall be stored in non-volatile memory.
4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.
5. The system shall be capable of programming any addressable input or initiating device to operate any single or group of addressable output devices or indicating circuits. Inputs shall be programmable to generate alarm or trouble or no audible alarm.
6. The system shall be programmed with means to bypass the HVAC shutdown feature.
7. The system shall be programmed with means to bypass the door release feature.

2.04 ENCLOSURES

A Control panels shall be housed in UL listed cabinets suitable for surface or semi-flush mounting.

B The backbox and door shall be constructed of 0.060 steel minimum with provisions for conduit connections into the sides and top.

C The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

D The enclosure shall be modular in structure for ease of installation, maintenance and future expansion.

2.05 PRIMARY POWER SUPPLY

A The main power supply shall operate on 120VAC, 60Hz, and shall provide all necessary power to the FACP.

B It shall provide a battery charger using dual-rate-charging techniques for fast battery recharge. It shall charge up to 55 Amp-hour batteries within a 48-hour period.

C It shall be power-limited and include meters to indicate battery voltage and charging current.

2.06 SECONDARY POWER SUPPLY

A Batteries shall be 12-volt, Gel-Cell type.

B Batteries shall have sufficient capacity to power the fire alarm system for not less than 24 hours of standby plus 10 minutes of alarm upon a normal AC power failure.

C Batteries shall have a 25% capacity safety factor.

D Batteries are to be completely maintenance free.

2.07 SYSTEM COMPONENTS

A Strobe Lights

1. Shall operate on 24 VDC nominal.
2. Shall meet the requirements of the ADA as defined in UL standard 1971 and the following criteria:

    a. The maximum pulse duration shall be 2/10ths of one second with a maximum duty cycle of 40%.
    b. Unless otherwise specified on the Drawings, in corridors the intensity shall be a minimum of 15/75 candela.
    c. Unless otherwise specified on the Drawings, in assembly areas the intensity shall be a minimum of 30 candela.
    d. The flash rate shall be a minimum of 1 Hz and a maximum of 2 Hz.
    e. Wall mounted appliances shall have their bottoms at a height above the finished floor of 80 in. (2m).

3. Visual only devices shall have flush cover plate.
4. Visual devices shall be synchronized per NFPA 72.

B Audible/Visual Combination Devices

1. Shall meet the applicable requirements of Section A listed above for visibility.
2. Shall meet the following criteria for audibility:

    a. Audible devices shall have a sound level of not less than 75 dBA at 10 feet (3 m) or more than 120 dBA at the minimum hearing distance.
    b. To ensure that signals are clearly heard, audible devices shall have a sound level at least 15 dBA above the ambient sound level.
    c. Wall mounted appliances shall have their bottoms at a height above the finished floor of 80 in. (2m).

3. Audible/Visual devices shall have a flush cover plate.
4. Visual devices shall be synchronized per NFPA 72.

C Addressable Manual Stations

1. Addressable Manual Stations shall be provided to connect to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops. Manual stations shall be single action type unless otherwise indicated on the Drawings.
2. The Manual Station shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. Manual Fire Alarm Stations shall use a key operated test-reset lock, and shall be designed so that after actual Emergency Operation, they cannot be restored to normal use except by the use of a key.
3. All operated stations shall have a positive, visual indication of operation that cannot be reset without the use of a key.
4. Manual Stations shall be constructed with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
5. Stations shall be suitable for surface mounting as shown on the plans, or semi flush mounting, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.
6. The Manual Station shall provide address-setting means such as rotary decimal switches or binary dip switches.

D Intelligent Photoelectric Type Smoke Detectors

1. Smoke detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuit loops. Provide photoelectric detectors only where specifically required by the Drawings or specifications.
2. Photoelectric detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
3. The detectors shall be ceiling-mount and shall include a twist-lock base.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic switch, or may be activated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head such as rotary decimal switches or binary dip switches. The detectors shall also store an internal identifying code, which the control panel shall use to identify the type of detector.
6. The detectors shall have local indications of alarm and power with an LED. The LED shall flash under normal conditions, indicating the detector is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LED's shall be controlled through the system field program.
7. The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
8. Using software in the FACP, the detectors shall automatically compensate for dust accumulation and other slow environmental changes, which may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72E.

E Duct Smoke Detectors

1. The in-duct smoke detector housing shall accommodate an intelligent photoelectric detector with integral auxiliary contacts.
2. Each in-duct smoke detector shall include air-sampling tubes installed per manufacturer's recommendations and NFPA 72.

F Intelligent Heat Detectors

1. Heat Detectors shall be Intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuits.
2. The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
3. The detectors shall be ceiling-mount and shall include a twist-lock base.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic switch, or initiated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head such as rotary decimal switches or binary dip switches.
6. The detectors shall have local indications of alarm and power with an LED. The LED shall flash under normal conditions, indicating the detector is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LED's shall be controlled through the system field program.
7. An output connection shall also be provided in the base to connect an external remote alarm LED.

G Monitor Module - (ADDRESSABLE INPUT DEVICE)

1. Addressable Monitor modules shall be provided to monitor waterflow, tamper, and pressure switches
2. The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box.
3. The module may be wired for Style D or Style B operation. The Monitor module shall provide address-setting means using rotary decimal switches or binary dip switches and shall also store an internal identifying code, which the Fire Alarm Control Panel shall use to identify the type of device. An LED shall be provided which shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

H Control Module (ADDRESSABLE OUTPUT DEVICE)

1. Addressable Control Modules shall be provided to supervise and control the operation of the gas furnaces upon alarm.
2. The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox, or directly in the Fire Alarm Control Panel.
3. The Control Module shall provide address-setting means using rotary decimal switches or binary dip switches and shall also store an internal identifying code, which the Control Panel shall use to identify the type of device. An LED shall be provided which shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the Control Panel.

I Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on addressable loops. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit on the addressable loop.
2. If a wire-to-wire short occurs, the isolator module shall automatically open the addressable loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operation shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

4. The isolator shall mount in a standard 4" deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

J PIV Supervisory Switches

1. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.
2. Mount switch so as not to interfere with the normal operation of the valve. Adjust switch to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
3. The mechanism shall be contained in a weatherproof aluminum housing, which shall provide a 3/4-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
4. Switch housing to be finished in red baked enamel.
5. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
6. PIV supervisory switches shall be provided and connected under this section.

K Automatic Digital Alarm Communicator Transmitter

1. A dual line, 8 channel Digital Alarm Communicator Transmitter (DACT) shall be provided for transmission of fire alarm, supervisory, and trouble signals to a supervising station.
2. The DACT shall include a secondary power source (battery and charging unit) separate from the FAC secondary source.
3. The following signals shall be reported as applicable:
4. Fire Alarm
5. Fire Alarm Trouble (over 60 seconds)
6. Sprinkler Valve Tamper Supervisory Signal
7. Sprinkler Low Temperature/Air Pressure Supervisory Signal
8. The DACT shall be provided with two dedicated phone lines of the loop start type. Connection to PBX trunk lines or station circuits or to ground start type phone lines is not acceptable.

L Remote Annunciators

1. Remote annunciators shall be supervised, backlit, 80-character alphanumeric LCD displays.
2. The annunciator shall display all alarm, trouble, and supervisory conditions in the system.
3. Each annunciator shall include switches for system acknowledgements, alarm silence, and system reset. These switch inputs shall be capable of being disabled permanently or by a key lockout function on the front plate.
4. Wiring for remote annunciators shall be Style 7.

M High-powered Audible Appliance

1. Shall operate on 24 VDC nominal.
2. Appliance tone shall be a slow whoop pattern.
3. Audible devices installed in mechanical equipment rooms shall maintain a minimum average sound level of 85 dBA.

N Speakers

1. Shall operate on 25 VRMS with field selectable output taps from 0.5 to 2.0W.

2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3 m).
3. Frequency response shall be a minimum of 400 Hz to 4000 Hz.

2.08 ACCEPTABLE SYSTEM MANUFACTURER

A Honeywell

B Firelite

C Silent Knight

D Edwards

PART 3 - EXECUTION

3.01 INSTALLATION

A Installation shall be in accordance with the NEC, NFPA 72, state and local codes, as shown on the Drawings and as recommended by the equipment manufacturer.

B All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D The system shall be equipped with the following protective devices to prevent damage or nuisance alarms by nearby lightning strikes, stray currents, or voltage transients.

1. On AC input: Ditek DTK-120HW or DTK 120/240CM, EFI HWM-120, Leviton OEM-120EFI, Northern Technologies TCS-HW, Transtector ACP100BWN3, or equal UL listed device. Install device at the electrical panelboard and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil shall be 5 to 10 turns of about 1" diameter and tie-wrapped.
2. On DC circuits extending outside building: Near the point of entry to the building, provide suppressors equal to Simplex 2081-9027 and 2081-9028, Transtector TSP8601, Ditek DTKxLVL series, Citel America B280-24V, Northern Technologies DLP-42.

E Monitor, control, isolation, and other auxiliary control devices shall be located at a height not to exceed 6' above finished floor where possible.

F All addressable loop circuits shall have a minimum of 20% spare capacity for future use.

G Isolation modules shall be installed for each circuit extending outside the building, in or immediately adjacent to the FACP at each end of the addressable loop circuit, and after each T-tap serving five (5) or more addressable devices.

H There shall be no splices in the system other than at terminal blocks. Wire nuts and crimp splices are not acceptable.

I All devices and appliances shall be clearly identified by addressable loop name, floor, device type and device number as shown on Drawings.

J High-powered audible devices shall be installed in mechanical equipment rooms and other areas with high ambient noise levels.

3.02 GENERAL OPERATION

A When a fire alarm condition is detected and reported by one of the system's initiating devices, the following functions shall immediately occur:

1. The system alarm LED shall flash.
2. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
3. The 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

B When a trouble condition is detected and reported by one of the system's initiating devices or appliances, the following functions shall immediately occur:

1. The system trouble LED shall flash.
2. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
3. The 80-character LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
4. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.

C When a supervisory condition is detected and reported by one of the system's initiating devices or appliances, the following functions shall immediately occur:

1. The system supervisory LED shall flash.
2. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
3. The 80-character LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
4. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.

D Acknowledge Switch

1. Activation of the control panel acknowledge switch in response to a single new alarm and/or trouble condition shall silence the local piezo electric signal and change the system alarm or trouble LED from flashing mode to steady-ON mode. If additional alarm or trouble conditions exist or are detected and reported in the system, depression of this switch shall acknowledge and/or advance the LCD display to the next alarm or trouble condition.
2. Depression of the acknowledge switch shall silence all remote annunciator piezo sounders.

E Signal Silence Switch

1. Activation of the signal silence switch shall cause all notification appliances and relays which are programmed to do so to return to their normal condition after an alarm

condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards.

F System Reset Switch

1. Activation of the system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
2. If the alarm condition(s) still exist, or if they reoccur in the system after system reset switch activation, the system shall then re-sound the alarm condition(s).

G System Test Switch

1. Activation of the system test switch shall initiate the automatic test of all Analog/Addressable detectors in the system. The system test switch shall activate the electronics in each sensor, simulating an alarm condition and causing the transmission of the alarm condition from that sensor to the fire alarm control panel. The fire alarm control panel shall interpret the data from each sensor installed in the system. A report summarizing the results of this test shall be displayed automatically on the control panel's LCD and printer. This report shall display the number of detectors tested per addressable loop, the total number tested in the system, any detector that failed, or an all "Tested OK" message. Also included shall be a time/date stamp of when the test was performed.

H Lamp Test Switch

1. Activation of the lamp test switch shall sequentially turn on all LED indicators, LCD and local piezo electric signal, and then automatically return the fire alarm control panel to the previous condition.

3.03 INSTALLATION

A Conductor insulation colors used in the fire alarm system shall be as follows:

1.	SMOKE DETECTORS	Yellow and Blue
2.	PULL STATIONS	Orange and Brown
3.	24 V.D.C.	Red and Black
4.	DUCT DETECTORS	Yellow and Blue
5.	HEAT DETECTORS	Gray and Violet
6.	120 V.A.C.	Black and White
7.	GROUND	Green
8.	FLOW SWITCH	Orange and Brown
9.	TAMPER SWITCH	Gray and Violet
10.	SHIELDED SIGNAL CABLE conductors	Red and Black
11.	SHIELDED AUDIO CABLE conductors	Black and White

B Fire alarm system circuits shall be installed in EMT with metallic boxes or other raceway as specified herein.

C Door holder and electric locks shall be 24 V.D.C.

D Duct detectors shall reset directly from the transponders' monitor card.

E Each duct detector shall be equipped with a remote indicator at the entrance to the zone served.

F All annunciator and fire alarm panelboards shall identify zones by area name not number, e.g., basement, first floor, elevator, etc.

G Sprinkler valve supervisory switches shall be connected to initiate a rouble condition. Water flow alarm switches shall be connected to initiate an alarm condition. Tamper and water flow switches shall be connected to separate zones.

H Dedicated branch circuits shall provide primary power to the fire alarm control panel and remote power supplies.

I Dedicated branch circuit(s) and connections shall be mechanically protected.

J Cicuit disconnecting means shall have a red marking shall be accessible only to authorized personnel, and shall be identified as "FIRE ALARM CIRCUIT."

K The location of the circuit disconnecting means shall be permanently identified as the fire alarm control unit.

3.04 ACCEPTANCE TESTS

A Provide the service of a competent, factory-trained engineer or technician authorized by the system manufacturer to technically supervise and participate during all of the adjustments and tests of the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits, signaling line circuits, and notification appliance circuits to verify that the trouble signal activates.
5. Ground initiating device circuits, signaling line circuits, and notification appliance circuits to verify response of trouble signals.
6. Check alert tone and prerecorded voice message to all alarm notification appliances.
7. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
8. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

3.05 SPARE PARTS

A Provide the following spare parts with the system, each individually packaged and labeled.

1. Fuses – 2 of each size used in system
2. Manual Stations – 1% of installed quantity.
3. Visual and Combination Notification Appliances – 2% of installed quantity.
4. Detectors and Bases – 2% of installed quantity.

B Increase decimal quantities of spare parts to the next higher whole number.

END OF SECTION 28 31 00

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers all clearing and grubbing together with the removal and disposal of items.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1. Division 31 Section “Earthworks” for site excavating, filling, disposal of surplus earth and debris and finishing grading.
2. Division 31 Section “Earthworks” for excavating, filling, and backfilling for building construction.
3. Division 31 Section “Earthworks” for erosion, sedimentation and pollution control measures.

1.02 JOB CONDITIONS

A. Condition of Premises:

1. Accept the premises as found and clear the site as specified. The Owner assumes no responsibility for condition of site nor continuation in condition existing at time of proposal or thereafter. Assume risk regarding damage or loss, whether by reason of fire, theft, or other casualty or happening.
2. Assume all risk for downstream adjoiners from damage due to erosion, sediment or pollution.

B. Protection:

1. Existing Vegetation. Thoroughly protect from damage, existing individual trees, groups of trees, shrubbery, lawns and other vegetation to remain. Replace at no cost to the Owner, any trees, shrubs or sod in the same quantity and size as existing to remain which are severely damaged or destroyed.
2. Public and Property. Accomplish all Work in a manner that provides for the safety of the public and all workmen and provide for the protection of all property.
3. Protect all downstream adjoiners from erosion, sediment and pollution.
4. Contact the Utility Protection at (811) in ample time to have all existing utilities located. Field verify the horizontal and vertical location of all utilities prior to construction operations. Protect all utilities from damage or interruption. Contractor is solely responsible for any damages occasioned due to his failure to verify the location or protection of utilities.

C. Access:

1. Maintain vehicular access throughout the duration of the project to all adjacent or nearby properties.

PART 2 – PRODUCTS (NOT USED)

SECTION 31 11 00

CLEARING AND GRUBBING

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Clearing and Grubbing:

1. Clearing. Fell trees, dispose of trees and other vegetation designated for removal, together with the downed timber, snags, brush and rubbish, occurring within the construction limits. Trim individual trees and groups of trees designated to be left standing within the cleared areas of all dead branches and of all live branches to such heights and in such manner as are indicated on the Drawings or directed by the Architect. All limbs, branches and roots damaged during construction, together with those required to be trimmed, shall be neatly cut next to the bole of the tree or main branch or root. Cuts more than 2 inches (50 mm) in diameter thus made and any injury to the tree trunk or main branches shall be immediately painted with tree wound paint.
2. Grubbing. Remove and dispose of all stumps, all matted roots and all roots larger than 3 inches (75 mm) in diameter in all construction areas.
3. Removal. Remove all cleared and grubbed materials completely away from the site. Do not store or permit debris to accumulate on the site. If the Contractor fails to remove excess debris promptly, the Owner reserves the right to cause same to be removed at Contractor's expense.
   a. Remove all temporary structures when they are no longer required.
   b. Legally dispose of all cleared and grubbed materials removed from site.

END OF SECTION 31 11 00

SECTION 31 23 00

EXCAVATING AND FILL

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers the excavation, filling and backfilling complete.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to this Section.

1. Division 31 Section “Earthwork” for clearing and grubbing.
2. Division 31 Section “Earthwork” for site excavating, filling, disposal of surplus earth and debris and finished grading.
3. Division 31 Section “Earthwork” for erosion, sedimentation and pollution control measures.

1.02 QUALITY ASSURANCE

A. Tests:

1. Sufficient tests to ascertain that the specified density is being obtained, throughout the fill and backfill, will be made by a Geotechnical Engineer selected by the Owner and paid by the Owner.

B. Observation and Instruction:

1. Remove unsuitable material at the direction and under the observation of the Geotechnical Engineer.

C. A Survey of all property lines and bench marks by a Georgia Registered Land Surveyor. Maintain same throughout the duration of the project.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Test Reports:

1. Submit all field test results to Architect for review.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of Materials, Equipment, and Fixtures:
1. Material storage. Stockpile suitable excavated materials, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Do not stockpile on edge of excavations.

1.05 JOB CONDITIONS

A. Existing Conditions:

1. Subsurface Information.
a. Soil borings for design purposes have been made at the site. The Geotechnical Investigation Reports are provided in Specification Section 02 32 13 for the Contractor's information. Examine the site and Geotechnical Investigation Report of the exploration and decide the character of the materials to be encountered.

B. Environmental Requirements:

1. Water.
   a. Ground Water. Keep the building excavation free of seepage and ground water at all times. The Contractor shall be responsible for the lowering of the ground water level to at least three feet below the proposed foundation bearing elevation.
   b. Surface Water. Prevent surface water from running into the excavated areas. Water which accumulates in the excavation shall be removed promptly. Furnish and maintain all necessary bailing, draining, pumping and sheathing.
   c. The Contractor shall be responsible for all additional work required if ingress of ground and/or surface water softens excavated areas.

C. Protection:

1. Repair damage done to Owner's property or any other property on or off premises by reason of required Work.
2. Existing Underground Utilities. Have all utilities marked and verify horizontal and vertical locations of all utilities. Contact the Utility Protection Center at 811. Any underground utilities found to exist within the building excavation and not shown on the Drawings shall be removed and/or relocated in accordance with the terms of the General Requirements.
3. Temporary Protective Fence. Erect and maintain a temporary fence around any excavations for public safety in accordance with local ordinances as shown on the Drawings.

D. Access:

1. Maintain vehicular access throughout the duration of the project to all adjacent or nearby properties.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Use fill and backfill material consisting of suitable soil excavated from the excavation, select borrow material or granular material, all subject to approval. If the Contractor elects to use other sources for fill material instead of natural excavation he shall do so at his own expense. Use material free of organic soil, trash, lumber, frozen material, chunks of concrete or other debris.

A. Granular Material. When called for on the Drawings, use the material specified herein, placed and compacted as specified under "PART 3. EXECUTION."

1. Granular Fill or GAB Beneath Slabs-On-Grade. Use free draining gravel or GAB conforming to GA DOT specifications.
2. Free Draining Granular Fill for Backfill. Use sand-gravel conforming to the gradation for granular fill beneath slabs-on-grade if noted on plans.

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. The Contractor accepts full responsibility for all excavations. Protect all excavations from collapse. Where possible, embankments over 5' shall have a slope no greater than 1-1/2 horizontal to 1' vertical.

B. Excavation, General Requirements:

1. General Excavation. Excavation shall conform to the dimensions and elevations indicated on the Drawings for each building and structure and all work incidental thereto. Excavation shall be carried far enough beyond the wall line to permit removal of forms and application of dampproofing or waterproofing as specified. The bottom surface of all excavations shall be leveled off at the depth required.
   a. All material shall be unclassified, and is to be excavated by normal excavation methods, including ripping, blasting, etc.
   b. All excavated material required for grading around buildings shall be placed as specified under Division 31, EARTHWORK.
   c. Excavated materials which are considered unsuitable and surplus of excavated material not required for fill shall be known as waste and shall be legally disposed of off site.
   d. Additional costs of labor and materials due to careless excavation beyond the lines and depths shown by the Drawings shall be borne by the Contractor.
2. Footing Excavation. Excavation for footings shall be cut vertically from the widest part of the footing. Undercutting for footing projections will not be permitted.
   a. Footings shall be cast immediately after excavation is completed and reinforcing placed, or the last 4 to 6 inches (100 to 150 mm) of subsoil shall not be removed until preparations are complete for casting footings. For footings which bear on earth, place concrete on undisturbed soil.
   b. In conditions where suitable bearings are encountered at different elevations from those indicated on the Drawings, the Architect shall direct in writing that the excavation be carried to elevations above or below those indicated on the Drawings.
   c. Cold Weather Protection: Protect excavation bottoms against freezing when temperature falls below 32 degrees F. (0 degrees C.).
3. Trench Excavation. Carefully excavate trenches included in the building maintaining a minimum width and in no way impairing the bearing value of any footing or foundation.
4. Slabs-on-grade. Where existing grade is at or below the elevation of the floor slabs-on-grade, remove the top 6 inches (150 mm) and bring the grade to the proper elevation by filling. Where excavation is made below the elevations indicated on the Drawings, restore to the proper elevation in accordance with the procedure hereinafter specified for filling.
5. Employ bracing designed by a Georgia Registered Structural Engineer as needed.

C. Filling and Backfilling.

1. Placement. Prior to filling or backfilling, clean area of all trash and debris. Remove forms prior to any backfilling. When subgrade is of less than the specified density, bring to proper moisture content and compact as herein specified. This may include scarifying the top 6 inches (150 mm) of subgrade surface. Place earth or friable materials in successive horizontal layers of material of not more than 6 inches (compacted thickness). Hand tamp or vibrate backfill adjacent to foundation walls and around piers. Wet or dry by aeration each layer and then compact as specified. Methods of compacting shall be subject to review. Do not damage or endanger adjacent construction or facilities.
   a. Fill shall be brought to the grades indicated on the Drawings.
   b. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof. Work to the final grades established immediately around the building.
   c. Construct granular fill beneath slabs-on-grade on the previously prepared subgrade to the lines, grades, thicknesses and dimensions shown on the Drawings at the locations indicated. Place and spread material on previously prepared subgrade that has been moistened sufficiently to prevent moisture loss in foundation materials but not enough to cause soft spots. Place sufficient material so that when spread, struck

off by an approved template and compacted as required herein, the resulting granular fill is of the required thickness and shape. After compaction, check the surface with template and straight edge, and correct and recompact all high or low spots.

2. Compaction.
   a. Maximum density determination. Make tests on two separate samples to determine maximum density at optimum moisture. Take samples where directed by the Architect.
   b. General Compaction. Wet or dry by aeration, all fill and backfill and then compact to at least the following percentage of maximum density at a moisture content above or below optimum moisture within the range specified as determined by "Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) Rammer and 12 inch (304.8 mm) Drop" ASTM D 698:

MATERIAL	PERCENT OF MAX. DENSITY	WATER CONTENT RANGE ABOVE OR BELOW OPTIMUM
Top 24" under pavement, slabs and footings	98 Percent	3 Percent
Other fill	95 Percent	3 Percent

   c. Compact granular material (GAB) to 95 percent of the maximum dry density determined by ASTM D 1557.

D. Performance:

1. Perform all Work in accordance with the requirements of the Drawings, specifications, and applicable local codes and in a manner which will ensure reasonable accuracy in preserving lines and levels shown on the Drawings.
2. Filling and compaction shall be monitored by the Geotechnical Engineer.
3. The Contractor shall be responsible for the documentation of the quantities of mass or trench to be removed from the site. Measurements of the elevations of rock (prior to blasting) shall be made by the Contractor's blasting subcontractor by drilling test holes in the presence of the Geotechnical Engineer. The actual volume of rock removed from the project will be calculated from the comparison of before-blast rock elevations and the elevations of excavation as required by the Construction Documents.

3.02 FIELD QUALITY CONTROL

A. Field Tests:

1. Compaction Tests. Soil compaction testing frequencies as follows:
   a. (1) test per 2' depth per 2000 sf. under building pads.
   b. (1) test per 2' depth per 5000 sf. under paved areas.
   c. (1) test per 2' depth per 10000 sf. elsewhere.
   d. (1) test per 2' depth per 50 lf. of trench backfill.
2. Areas which do not meet the compaction specifications should be re-compacted to achieve compliance. In confined areas, such as utility trenches, the use of portable compaction equipment and thin lifts of 3 to 4 inches may be required to achieve compaction. Where full-time inspection by a Geotechnical Engineer is required, the number of tests shall be as required by the Geotechnical Engineer.
   a. Test Failure. When fill or backfill does not meet the required compaction, remove, re-compact and retest at no expense to the Owner or Architect.

b. Inspection. The Contractor shall notify the Geotechnical Engineer at least two (2) days prior to the Work to be inspected. Cooperate with the Geotechnical Engineer to facilitate the keeping of records specified herein and as required by the Geotechnical Engineer. The Geotechnical Engineer is a representative of the Owner and the Contractor shall assume toward him all the obligations and responsibilities that he assumes toward the Architect.

END OF SECTION 31 23 00

SECTION 32 12 00

FLEXIBLE PAVEMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Work required under this Section includes all labor, material, equipment and services necessary for and reasonably incidental to the proper completion of bituminous pavements as indicated on the Drawings or herein specified.

B. Related Work Specified Elsewhere:

1. Division 31 Section “Grading” for sub-grade preparation.

1.02 QUALITY ASSURANCE

A. Use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot mix, job-laid asphalt concrete.

B. Comply with applicable requirements of The Latest Edition Georgia Department of Transportation, Standard Specifications for Construction of Roads and Bridges and any supplemental standards and specifications thereto.

C. Testing Agency: Testing and sampling shall be performed by an independent testing laboratory provided by Owner.

D. All areas to receive pavement shall be proof-rolled in the presence of a representative of the Geotechnical Engineer immediately prior to the placement of base course. Refer to Geotechnical Report for information.

E. Tests: The following tests are required:

1. Graded Aggregate Base Course. Test one (1) sample of the compacted base course of the first 200 cubic yards of material or fraction thereof and for each additional 400 cubic yards or fraction thereof to determine that the density requirement herein specified is met.
2. Bituminous Materials. Each shipment shall be covered by a manufacturer's certified analysis or certificate of compliance.
3. Mineral Aggregates. One sample from each source for complete test of all requirements. Additional gradation tests at the rate of one test per each 1000 yards of material furnished.
4. Asphaltic Concrete.
    a. Job Mix Formula. One test prior to starting work for each type of mix to determine percentage of various aggregates to be used and amount of asphalt cement to be added. For projects with less than 1000 tons of each material, Contractor may use a mix formula which has been used or is being used on other projects. This information to be supplied by the Contractor.
    b. Compaction Test. One Test for each 500 square yards of surface area shall be taken as directed by the Geotechnical Engineer.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

C. Mix Design: Submit Mix Design for each course to Architect for acceptance.

D. Sampling Pavements and Mixtures:

1. Remove suitably sized samples, as required by the Architect for the determination of thickness and density of the completed pavements. Use cores drilled from the base and surface courses to test the density of the pavement by either ASTM D 1188 or ASTM D 2726 whichever is applicable. Use the same cores used to test the density to measure the thickness of the pavement. Make up any deficiency in base thickness with the surface mixture when the surface course is applied. Furnish all tools and labor for cutting samples and replacing the pavement to the satisfaction of the Architect.

1.04 JOB CONDITIONS

A. Weather Limitations.

1. Apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 40 degrees F. for two hours and rising.
2. Do not conduct paving operations when surface is wet, frozen or contains excess of moisture which would prevent uniform distribution and required penetration.
3. Construct asphaltic courses only when atmospheric temperature in the shade is above 35 degrees F, when the underlying base is dry and when weather is not rainy.
4. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen or muddy subgrade.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Graded Aggregate Base Course: Grade aggregate base course shall be of uniform quality throughout and shall meet the requirements of Section 815.2.01 of the Georgia Department of Transportation Standard Specifications.

B. Binder Course: Binder course shall be uniform quality throughout and shall conform to the requirements of Section 828.2.03, 19mm Superpave GP 1 or 2, of the Georgia Department of Transportation Standard Specifications.

C. Surface Course: Surface course shall be of uniform quality throughout and shall conform to the requirements of Section 828.2.03, 9.5 mm Superpave TP 2 GP2, of the Georgia Department of Transportation Standard Specifications.

D. Tack coat shall conform to the requirements of Section 413 of Georgia Department of Transportation Standard Specifications.

E. Refer to Drawings and construction details for thickness of pavement layers.

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE

A. Construct all pavements in a workmanlike manner at the location and to the lines and levels shown on the Drawings and place pavement in a manner to insure uniform surfaces free from defects.

1. Shaping and compacting graded aggregate rock base course. Spread the materials uniformly over the subgrade in layers whose depth does not exceed that which the equipment on the Project is capable of compacting to the required density.
   a. Accomplish the preliminary compaction by rolling with tamping or grid type rollers. Accomplish the final compaction by rolling with multiple wheel pneumatic rollers and a tandem or three-wheel roller. Continue rolling until the base course material is compacted throughout the full depth, to at least 95 percent of the density at optimum moisture based on the weight per cubic foot of the material passing the No. 4 sieve, as determined by ASTM D 1557.
   b. The use of vibratory compactor in lieu of rolling equipment will be permitted, provided the compaction requirements can be met and a satisfactory surface can be obtained.
   c. Continue blading, rolling and tamping until the surface is smooth and free from waves and inequalities. Add water before and after the final rolling as directed by Architect's engineer.
   d. To facilitate the obtaining of a smooth satisfactory surface, the use of a small application of crushed rock screenings (material passing the 1/2 inch sieve), may be permitted.
   e. The surface shall not show any deviations in excess of 3/8 inch when tested with a 10 foot straightedge applied parallel with and at right angles to the centerline of the surfaced area.
2. Shaping and compacting asphalt base course. Accomplish mixing and placing in accordance with the best practices and conform to ASTM D 995. Mixing time shall not exceed 60 seconds. Lay the mixture only upon a surface which is dry. Make sure that the surface is clean and free of any loose or foreign matter at the time of placing the mixture. Do not place the bituminous mixtures when the weather is rainy or the atmospheric temperature is below 40 degrees F., unless otherwise directed by the Engineer. Mixes with temperatures below 250 degrees F. will be rejected. Place the base course in one or more lifts. The minimum lift thickness shall be at least two times the maximum particle size.
   a. Place the mixture with an acceptable bituminous spreader in strips having a width of ten (10) feet and do not roll the 6 inch strip adjacent to the area on which additional material is to be laid until such additional material is placed, except when the work is to be discontinued. After the first strip has been placed and rolled, place the second strip and succeeding strips and extend rolling to include the 6 inches of the first strip not previously rolled. Place the succeeding strips while the unrolled 6 inch section of the adjoining is hot and in a readily compactable condition.
   b. Perform the compaction by the use of three-wheel rollers, tandem rollers, vibratory rollers and pneumatic-tired rollers.
   c. Begin rolling of the mixture as soon after placing as the mixture will bear the roller without undue displacement. Delays in rolling freshly spread mixture will not be tolerated. Start rolling longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least one-half of the width of the rear wheel of the roller.
   d. In all places not accessible to the rollers, compact the mixture thoroughly with hot hand tampers. Hand tampers shall weigh not less than twenty-five (25) pounds and shall have a tamping face of not more than fifty (50) square inches. Skin patching of

an area that has been finish rolled will not be permitted. Remove any mixture that becomes mixed with foreign material or in any way defective and replace it with fresh mixture, and compact it to the density of the surrounding area. The roller shall pass over the unprotected edge of the course only when the laying of the course is to be discontinued for such length of time as to permit the mixture to become cold. Continue rolling of the base course until all roller marks are eliminated, and a density has been obtained of at least 94 percent of the density of a laboratory specimen of the same mixture subjected to 50 blows of a standard Marshall on each side of specimen.

3. Tack Coat:
   a. Apply tack coat to asphalt base course immediately prior to spreading surface course materials.
   b. Quantity. Apply from 0.05 to 0.15 gallons per square yard of surface to be covered as directed by the Architect's engineer. Emulsified asphalt shall be diluted with an equal part of water.
   c. Application. Apply tack coat by means of a bituminous distributor so that a uniform distribution is obtained at all points. Apply tack coat on each layer of the base course and allow to cure before placing the succeeding course. Apply tack coat only as much pavement as can be covered with asphalt aggregate mixture in the same day.
4. Asphaltic Concrete Surface Course:
   a. The asphaltic concrete surface course shall consist of plant or hot-mix asphaltic concrete to be placed on previously prepared surfaces. It shall be placed in one or more courses and of the thickness as shown on the Drawings.
   b. Weather Limitations. Place the asphaltic concrete only when the primed or tack coated base course is dry, when the weather is not rainy and when the atmospheric temperature is above 40 degrees F.
   c. Mixing and Placing. Accomplish in accordance with the best practices and ASTM D 995. Place the mixture with an acceptable bituminous spreader in strips having a minimum width of 10 feet, and do not roll the 6 inch strip adjacent to the area on which additional material is to be laid until such additional material is placed, except, when the work is to be discontinued. After the first strip has been placed and rolled, place the second strip and succeeding strips and extend rolling to include the 6 inches of the first strip not previously rolled. Place the succeeding strips while the unrolled 6 inch section of the adjoining strip is hot and in a readily compactable condition.
   d. Compaction of Mixture. Perform compaction by the three-wheel rollers and tandem rollers. Begin rolling of the mixture as soon after placing as the mixture will bear the rolling without undue displacement. Make tests for conformity with the specified crown, grade and smoothness immediately after initial compression. Before continuing the rolling, correct any variations by removing or adding materials. Continue rolling until all roller marks are eliminated and density has been obtained of at least 96 percent of the density of a laboratory specimen of the same mixture subjected to 50 blows of a standard Marshall on each side of the specimen. During rolling, moisten the wheels of the rollers to prevent adhesion of the mixture to the wheels but an excess of water will not be permitted. In all places not accessible to the roller, compact the mixture thoroughly with hot hand tampers. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face of not more than 50 square inches.
   e. Joints. Make sure that all joints present the same texture, density and smoothness as other sections of the course.
   f. Smoothness. The finished surface shall not vary more than 1/8 inch when tested with a 10 foot straightedge applied both parallel with and at right angles to the centerline of the paved area.
   g. No bird baths deeper than 1/8" will be allowed, positive drainage is required

throughout.

3.02 CLEANING AND PROTECTION

A. Cleaning. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the Architect.

B. Protection:

1. Concrete curb and gutter or concrete crosswalks shall be protected from tack-coat overspray and asphalt track marks for the period necessary for the asphalt concrete pavement to cool and harden or until a time designated by the Architect.
2. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than 24 hours.
3. Provide barricades and warning devices as required to protect pavement and the general public.
4. Cover openings of structures in the area of paving until permanent coverings are placed.

END OF SECTION 32 12 00

SECTION 32 13 00

RIGID PAVEMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. General:

1. The Work required under this Section includes all labor, material, equipment and services necessary for and reasonably incidental to the proper completion of all pavements as shown on the Drawings or herein specified.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1. Division 31 Section “Grading” for sub-grade preparation
2. Division 03 Section “Cast in Place Concrete”

1.02 QUALITY ASSURANCE

A. Contractor’s concrete paving subcontractor shall be able to demonstrate successful past experience with commercial concrete paving projects.

B. Mill tests and/or manufacturer's certification of compliance with Specifications will be required for all joint material and sealing compound, membrane waterproofing and miscellaneous materials when requested by the Architect.

C. Concrete design mix is to be submitted to the Architect for review prior to pavement.

D. A concrete pavement pre-construction meeting with the Owner and Architect is required prior to placing any concrete pavement.

1.03 JOB CONDITIONS

A. Placing Temperature.

1. Warm Weather. Concrete placement will not be permitted when, in the opinion of the Architect, the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete in accordance with the requirements of this Section.
2. Cold weather. In addition to other requirements, in cold weather, heat, protect and prepare the subgrade so as to produce a satisfactory subgrade entirely free from frost when the concrete is deposited. Do not place concrete when the ambient temperature is below 35 degrees F. (2 degrees C.), nor when the concrete without special protection is likely to be subject to freezing temperature before final set has occurred.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Refer to Specification Section 03 30 00 Cast-in-Place Concrete for submittal requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Concrete shall have a strength as indicated on the Drawings.

B. Expansion joint filler shall be non-extruding and resilient bituminous type and conform to requirements of AASHTO M 213 or as otherwise indicated on the Drawings.

C. Joint sealer shall be of the hot poured type and shall consist of a resilient and adhesive plastic. The material shall be in accordance with ASTM D 1190.

D. Curing materials: Membrane curing compound shall be water soluble emulsion type linseed oil base compound and conform to the requirements for Type 2 compound as specified in ASTM C-309, except that requirements for the sag test and the drying time shall not apply. Where surfaces are to receive waterproofing, painting or any other surface treatment, use a compound which will have no deleterious effect to the application thereof.

E. Dowels shall conform to ASTM A 615, and shall be either grade 40 or 60 steel.

F. Expansion tubes shall be metal dowel caps or tubes manufactured from 32 gage sheet metal, shall be indented to provide a limiting stop for the dowel bar and shall provide unobstructed expansion space of not less than 1 inch (25 mm) to permit movement of the dowel bar. They shall be of proper size to fit the specified bars tightly and the closed end shall be watertight.

G. Oil protective solution shall consist of one part boiled linseed oil thinned with one part turpentine, naphtha, kerosene or mineral spirits.

H. Traffic paint shall be non-reflective paint conforming to GADOT Section 652 of the standard specifications or as otherwise shown on the Drawings.

I. All pavement markings within public rights-of-way shall be GADOT approved thermoplastic.

J. If not otherwise covered on the plans or in these specifications, all concrete pavement is to comply with GADOT Section 430 – Portland Cement Concrete Pavement. In the event of a discrepancy in requirements, the more stringent requirement shall reign.

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Concrete.

1. Forms.

a. General. Use metal forms unless otherwise specifically authorized by the Architect, except that on curves having a radius of 150 feet (50 m) or less, wood forms may be used. All forms shall be reviewed by the Architect.

b. Form Setting. The subgrade under the forms shall be compact and cut true to grade so that the forms will be firmly in contact with it for their entire length. Correct imperfections and variations of the grade in a manner satisfactory to the Architect. There shall be no settlement or springing of forms under the finishing machine. Connect each form section tightly by locked joints, free from play or movement in any direction. Check conformity to the alignment and grade elevation shown on the

Drawings and make necessary corrections immediately prior to placing the concrete.

c. Coating. Oil forms each time they are used.

d. Removal. Keep forms in place at least 12 hours after concrete has been placed against them or for a longer period if so directed by the Architect. Do not use crowbars or other heavy tools against green concrete when removing the forms. Clean forms well before reoiling and reuse.

2. Finishing.

a. General. Employ the machine method of finishing except that on odd widths or shapes, on curbs or on areas of 1000 square yards (1000 square meters) or less, hand methods will be permitted. Maintain all finishing equipment and tools clean, free from hardened concrete or grout.

(1) When a mechanical finishing machine is used. Strike off the concrete at such a height that after consolidation and final finishing, it shall be at the exact elevation as shown on the plans. Carry a depth of at least 2 inches (50 mm) of concrete in front of the strike-off screed for the full width of the slab whenever the screed is being used to strike off the pavement. The finishing machine shall be provided with a screed which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with the fewest possible number of passages of the machine. Keep hand-finishing tools available for use in case the finishing machine breaks down.

(2) When hand finishing is permitted, strike off the concrete and consolidate by a vibrating screed to the exact elevation as shown on the plans. When the forward motion of the vibrating screed is stopped, shut off the vibrator. Do not allow it to idle.

b. Longitudinal Floating--Machine. After the concrete has been struck off and consolidated, it shall be further smoothed by means of a mechanical longitudinal float of a suitable design. In order to allow enough time for consolidation of the concrete, it may be necessary for the float to lag the finishing operation by as much as one hour. The float machine shall be of such a design that the float is operated transversely across the pavement with its longitudinal axis approximately parallel to the centerline and successive passes lapped at least one-half the length of the float.

c. Longitudinal Floating--Hand. When hand finishing is permitted, operate the longitudinal float from foot bridges spanning the pavement and the float shall be worked with a wiping motion, parallel to the pavement centerline and passing from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than one-half the length of the float. The float shall be not less than 12 feet (3.65 m) long and 6 inches (150 mm) wide and shall be properly stiffened and provided with handles at each end.

d. Scraping. After the passage of the longitudinal float, scrape the pavement with a straightedge from 6 to 10 feet (2.0 to 3.0 m) long, equipped with a handle to permit it to be operated from the edge of the pavement. Operate the straightedge so that any excess water, laitance and inert material are removed from the surface of the pavement.

e. Straightedging. After the longitudinal floating has been completed and any excess water removed, but while the concrete is still plastic, test the slab surface for trueness with a l0 foot (3.0 m) straightedge swung from handles 3 feet (1.0 m) longer than one-half the width of the slab. Place the straightedge on the surface of the pavement parallel to the centerline and at not more than 5 foot (1.52 m) intervals transversely. After each test move the straight edge forward one-half its length and repeat the operation.

(1) When irregularities are discovered, correct them by adding or removing

concrete, float all disturbed places with a wood or metal float not less than 3 feet (1.0 m) long and not less than 6 inches (150 m) wide, and again straightedge. Avoid depressions on the pavement surface in which water will stand.

f. Belting shall follow the straight edging when most of the water sheen has disappeared and just before the concrete becomes non-plastic. Belt the surface with a two-ply canvas belt not less than 6 inches (150 mm) wide and at least 3 feet (1.0 m) longer than the width of the slab, or with an acceptable wooden belt. Use hand belts that have suitable handles to permit controlled uniform manipulation. Operate the belt with short strokes transverse to the road centerline while advancing parallel to the centerline.

g. Burlap drag shall follow belting and the drag shall have at least 3 feet (1.0 m) in contact with the pavement and be 4 feet (1.2 m) longer than the width of the slab under construction. Keep it clean and saturated while in use. It shall be laid on the surface of the pavement and dragged forward in the direction in which the pavement is being laid.

h. Edging. After final finishing is completed, but before the concrete has taken its initial set, finish the edges of the slab carefully with an edger of the radius shown on the plans.

i. Final Surface Texture. The final surface of the concrete pavement shall have a uniform gritty texture free from excessive harshness and true to the grades and cross-section shown on the plans. The Architect may require changes in the final finishing procedure of belting, or burlap drag as required to produce the desired final surface texture.

j. Concrete Integral Curb. Concrete shall be placed monolithically with the concrete for the pavement slab by the use of finish machine screeds, vibrating screeds or compaction templates provided with notches at the ends to allow sufficient concrete to be deposited for the curbs at the same time it is being deposited for the slab. Integral curb shall receive the same surface treatment as the concrete pavement slab.

3. Curing.

a. General. Cover and protect all concrete from moisture evaporation, rapid temperature change and from rain, flowing water and mechanical injury during a period of at least 72 hours immediately following the finishing and edging of the pavement. The use of a covering material which contains or becomes contaminated with sugar in any forms, tannic acid or any other substance considered detrimental to Portland cement will not be permitted. The initial curing medium shall be effective and applied so as to prevent checking, cracking and the appearance of dry spots in the surface of the concrete. Protect the sides of concrete slabs exposed by the removal of forms immediately to provide continuance of curing and prevent injury of the concrete edges and the underlying subgrade. When it is expected, during the progress of the work before all concrete has attained final set, that the temperature may fall below 35 degrees F., maintain a sufficient supply of straw, hay or other suitable material on hand on the Project Site to cover the concrete and to adequately protect its surface and edges against freezing until it is at least 10 days old.

b. Membrane curing compound. Use no compounds until they have been reviewed by the Architect.

(1) Application. Agitate the curing compounds thoroughly during use and spray uniformly in a single coat by acceptable spraying equipment on all concrete surfaces at a rate recommended by manufacturer and based on moisture retention tests. Make the application immediately following the final finishing operation.

c. Protection of treated surfaces. Keep concrete surfaces, to which membrane

compounds have been applied, free from all foot and vehicular traffic and all other sources of abrasion for a minimum period of 72 hours.

d. Combination Curing. After joints have been cut and forms removed, mats used for curing may be removed and a membrane curing compound applied to protect the concrete during the balance of the curing period.

e. Surface Test. After the concrete curing period, Test the surface of pavements again with a straightedge or device which shall be operated in such manner as to reveal any irregularities. Remove any portion of the pavement which shows a variation or departure greater than 1/8 inch (3 mm) from the testing edge of a 10 foot (3.0 m) straightedge and replace or correct it as directed by the Architect. No area of pavement removed and replaced and no adjacent slab or portion of a slab which remains in the pavement abutting the replacement slab shall have length or width less than 10 feet (3.0 m).

4. Joints.

a. General. Place and finish joints for pavements as shown on the Drawings or as directed by the Architect. Tool and round all joints and edges. Joints shall be perpendicular to the finished grade of the concrete and when tested with a straightedge placed at right angles across the joint, make sure the surfaces of adjacent slabs do not vary from the straightedge by more than 1/8 inch (3 mm). All transverse, expansion, and contraction joints shall be straight and continuous to edge of concrete. Do not stagger joints in abutting pavement unless otherwise shown on the drawings.

b. Contraction joints. Form transverse and longitudinal contraction joints by sawing grooves in the top portion of the freshly placed concrete or by use of preformed joint strip of the type shown on the Drawings. Edge the contraction joints on both sides. Saw joints after the concrete is hardened. Complete sawing joints within 6 hours after the concrete has been placed. If templates are used for forming curbs, open the joints caused by the templates with a double-edger while the concrete is still soft. If no template is used, extend the contraction joint through the curb to a minimum depth of 8 inches (200 mm).

c. Construction joints. Install longitudinal construction joints and transverse joints at points where the placing of concrete is discontinued a sufficient time for the concrete to start hardening. At the close of a day's work or when pouring of concrete is stopped, install a transverse butt type construction joint with dowels if the joint occurs at the location of a contraction joint. Use keyed joints with tie bars if the joint occurs at any other location. Joints between construction lanes shall be of the keyed construction joint type. Edge all construction joints with a tool which will make a groove of sufficient width and depth to receive and effectively retain joint sealing material.

d. Expansion joints. Form expansion joints by means of joint filler material. Devices used for installing the joints shall be adequate to hold the joint in proper position and to protect the filler from damage during concreting operations and shall be removable without final detriment to the concrete. Fit adjacent sections of filler tightly together and hold in line to insure continuity and to prevent any concrete from entering the expansion space. Cut out immediately any concrete which has flowed into a gap between an expansion joint strip and the edge forms of the concrete, after the forms have been removed. Form expansion joints against all buildings, structures and features which project through, into or against the concrete. The filler shall form a complete uniform separation between the structure and concrete and the top edge of the filler shall be 1 inch (25 mm) below the pavement surface.

e. Joint Sealer. Fill all pavement joints with joint sealing material immediately following the curing period or as soon thereafter as weather conditions permit. Clean the joints thoroughly and fill the joints to 1/8 inch (3.17 mm) below the

surface of the concrete. Remove all excess sealing material from the concrete. Make sure the joints are dry and the atmospheric temperature is above 50 degrees F. (10 degrees C.) at the time of application of the joint sealing materials.

5. Patching. After removal of forms, fill all damaged or honeycombed areas with mortar, one part cement to two parts sand. No patching will be allowed on the surface.
6. Protection. Protect the pavements against all damage prior to Substantial Completion. Exclude traffic from the pavements by erecting and maintaining barricades and signs until the concrete is at least 14 days old or for a longer period if so directed by the Architect.
7. Pavement Painting. Pavement painting shall be 4 inch (100 mm) stripes painted in the pattern indicated on the Drawings. Apply two coats of traffic paint. Apply the first coat not less than 28 days after the placing of the pavement. Immediately before applying the paint, clean the pavement surface of all dust, dirt and other objectionable materials. Apply the paint by spray or other acceptable means. Apply the paint so that uniform distribution of the area to be covered is obtained. Provide masking so that paint is contained within the area to be painted. The color of the paint shall be white or yellow as directed by the Architect.

3.02 FIELD QUALITY CONTROL

A. Workmanship.

1. Construct all pavements in a workmanlike manner at the location and to the lines and levels shown on the Drawings. Form and place pavement in a manner to insure uniform surfaces free from defects.

END OF SECTION 32 13 00

SECTION 32 16 00

CURB, GUTTER AND SIDEWALKS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers the construction of combination curb and gutter when not integral with the pavement slab and services necessary for and reasonably incidental to the proper of all sidewalks as shown on the Drawings or specified.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1. Division 31 Section “Grading” for sub-grade preparation.
2. Division 03 Section “Cast-in-Place Concrete”

1.02 QUALITY ASSURANCE

A. Source Quality Control.

1. Mill tests and/or manufacturer's certification of compliance with Specifications will be required for all joint material and sealing compound, membrane waterproofing and miscellaneous materials, when requested by the Architect.

B. Georgia Department of Transportation Standards for Roads and Bridges, Latest Edition.

1.03 JOB CONDITIONS

A. Environmental Requirements:

1. Placing Temperature.
   a. Warm Weather. Concrete placement will not be permitted when, in the opinion of the Architect, the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete in accordance with the requirements of these Specifications.
   b. Cold Weather. In addition to other requirements, in cold weather, heat, protect and prepare the subgrade to produce a satisfactory subgrade entirely free from frost when the concrete is deposited. Concrete shall not be placed when the ambient temperature is below 35 degrees F. (2 degrees C.), nor when the concrete without special protection is likely to be subject to freezing temperature before final set has occurred.

1.04 SUBMITTALS

A. General: Submittals shall be in accordance with Specifications Section 01 33 00.

B. Refer to Specification Section 03 30 00 Cast-in-Place Concrete for submittal requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Concrete. Use Class ‘A’ with minimum compressive strength at 28 days of 3,000 psi. Concrete curb and gutter within public rights-of-way shall be in accordance with GDOT specifications.

B. Expansion Joint Filler. Preformed non-extruding bituminous-treated fiberboard conforming to ASTM D 1751.

C. Sealants.

1. Polysulfide Based Sealant. Joint sealer shall be two-part non-sag polysulfide sealant, "Sonolastic Two-Part Sealant" manufactured by Sonneborn Building Products; "Sealtight CM-600 Sealant" manufactured by W.R. Meadows Inc.; or "Chem-Calk 200 Sealant" manufactured by Bostik Construction Products Division. Color shall be as selected by the Architect. Use this non-sag sealant for both horizontal and vertical applications.

D. Curing Materials: Membrane curing compound shall be water soluble emulsion type linseed oil base compound and conform to the requirements for Type 2 compound as specified in ASTM C 309, except that requirements for the sag test and the drying time shall not apply.

E. Oil protective solution shall consist of one part boiled linseed oil thinned with one part turpentine, naphtha, kerosene or mineral spirits

F. Welded wire fabric shall be 6" x 6" - 10/10

PART 3 – EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Concrete.

1. General. Use metal forms unless otherwise specifically authorized by the Architect, except that on curves having a radius of 150 feet or less, wood forms may be used. All forms shall be reviewed by the Architect.
   a. Form Setting. The subgrade under the forms shall be compact and cut true to grade, so that the forms will be firmly in contact with it for their entire length. Correct imperfections and variations of the grade in a manner satisfactory to the Architect. Join each form section tightly by locked joints, free from play or movement in any direction. Check conformity to the alignment and grade elevation indicated on the Drawings and make necessary corrections prior to placing the concrete.
   b. Coating. Oil forms each time they are used.
   c. Removal. Keep forms in place at least 12 hours after concrete has been placed against them or for a longer period if so directed by the Architect. Do not use crowbars or other heavy tools against green concrete in removing the forms. Clean forms well before re-oiling and reuse.
2. Finishing. Test the subgrade for elevation and density in advance of placing concrete. Correct any discrepancies in accordance with the requirements for subgrade preparation.
   a. Tamp and space the concrete so as to produce a dense concrete in which the mortar has been worked to the surface. Strike off the concrete to the required cross section and smooth the upper face of the gutter slab and the front face and top of the curb with a wood float. Use an edging tool on all exposed corners. When completed, the surface of the curb and gutter shall be straight and true, and shall conform to the shape and dimensions indicated on the plans and shall have a first-class float finish of sandy or gritty texture.
3. Joints.
   a. General. Provide contraction and expansion joints in all curb and gutters. Place and finish joints as indicated on the Drawings or as directed by the Architect. Make sure all joints are perpendicular to the finished grade.
   b. Contraction Joint. Place contraction joints so that monolithic sections shall be in 8

foot sections. Separate each section by a 1/8 inch thick steel template. Remove templates as soon as practicable after the concrete has been struck off, and set sufficiently to preserve the shape of the joint.

c. Expansion Joint. Form expansion joints by a preformed filler material cut and shaped to the cross section of the curb and gutter. Provide expansion joints at the ends of all return radii. Expansion joints shall be provided 1/2 inch in width at intervals not exceeding 40 feet.

d. Sealing. Fill the joints with sealing material, specified herein, as indicated on the Drawings or as directed by the Architect. Make sure that the joints are cleaned, dried and poured as soon after the end of the curing period as weather conditions permit. Perform the work in a neat workmanlike manner without spilling and remove all excess material.

4. Patching. After removal of forms, fill all damaged and honeycombed areas with mortar, one part cement to two parts sand. No patching is allowed on the surface.

5. Curing.

a. General. Cover and protect all concrete fully from moisture evaporation, rapid temperature change and from rain, flowing water, and mechanical injury during a period of at least 72 hours immediately following the finishing. The use of a covering material which contains, or becomes contaminated with sugar in any form, tannic acid, or any other substance considered detrimental to portland cement, will not be permitted. The initial curing medium shall be effective and applied so as to prevent checking, cracking, and the appearance of dry spots in the surface of the concrete. Protect the sides of concrete slabs exposed by the removal of forms immediately to provide continuance of curing and prevent injury of the curb and gutter edges and the underlying subgrade. When it is expected during the progress of the work, and before all concrete has attained final set, that the temperature may fall below 35 degrees F. (2 degrees C.), a sufficient supply of straw, hay or other material suitable in the opinion of the Architect must be maintained on hand on the Project Site, to cover the concrete and to adequately protect its surface and edges against freezing until it is at least 10 days old.

b. Membrane Curing Compound. No compound shall be used until it has been reviewed by the Architect.

(1) Application. Agitate curing compounds thoroughly during use, and spray uniformly, in a single coat, by approved spraying equipment, on all concrete surfaces, at a rate recommended by the manufacturer and based on moisture retention tests. Application will be made immediately following the final finishing operation.

6. Protection:

a. Protection of Treated Surfaces. Keep concrete surfaces to which membrane compounds have been applied free from all foot and vehicular traffic and all other sources of abrasion for a minimum period of 72 hours.

b. Protection. Protect the curb and gutter against all damage prior to Substantial Completion. Exclude the traffic from the pavement by erecting and maintaining barricades and signs until the concrete is at least 14 days old, or for a longer period if so directed by the Architect.

3.02 FIELD QUALITY CONTROL

A. Workmanship.

1. Construct all curbs in workmanlike manner at the location and to the lines and levels indicated on the Drawings.

B. Curbs or sidewalks damaged during construction shall be replaced in sections at no cost to Owner

SECTION 32 16 00

CURB, GUTTER AND SIDEWALKS

END OF SECTION 32 16 00

SECTION 32 31 00

FENCES AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel welded wire fences.
2. Steel welded wire gates.
3. Concrete post foundations.

B. Related Sections:

1. Division 01: Administrative, procedural, and temporary work requirements.
2. Section 03 3000 - Cast-In-Place Concrete.
3. Section 31 2300 - Excavation and Fill.

1.2 REFERENCES

A. ASTM International (ASTM):

1. A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
2. A641/A641M - Standard Specifications for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
4. C94 - Standard Specification for Ready-Mixed Concrete.
5. D3359 - Standard Practice for Measuring Adhesion by Tape Test.

1.3 SUBMITTALS

A. Submittals for Review:

1. Shop Drawings: Indicate fence locations, post spacing, system components, and accessories.
2. Product Data: Manufacturer's descriptive data.
3. Samples:
   a. 12” x 12” fence panel samples.
   b. 12” long post samples.
   c. Cap, gate hardware and bracket samples.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 2 years documented experience in work of this Section.

B. Mockup:

1. Size: Minimum 16 feet long x full height.
2. Show: Fence posts, panels, and accessories.
3. Locate where directed.
4. Approved mockup may remain as part of the Work.

1.5 WARRANTIES

A. Furnish manufacturer's warranty providing coverage against corrosion of galvanized steel coatings and blistering or loosening of powder coatings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Deacero S.A. DE C.V.
B. Substitutions: [Under provisions of Division 01.] [Not permitted.]

2.2 COMPONENTS

A. Fence Panels:
   1. Resistance welded steel wire mesh, ASTM A185/A185M, double 1 gauge horizontal wires with 4 gauge vertical wires between, all are Class 1 galvanized steel wire per ASTM A641/ A641M, 2 x 8 inch mesh, stiffened.
   2. Height: 8 feet.
   3. Wire breaking load: Minimum 75,000 to 105,000 PSI.
   4. Weld shear strength: Minimum 1,050 pounds.

B. Posts:
   1. Galvanized steel tube, ASTM A513/A787, G60 coating class, 3 x 3 inches, 11 gauge.
   2. Length: To suit panel height and post mounting method.
   3. Post caps: Ultraviolet-protected plastic, sized to post dimensions, friction fit.
   4. Post bases: Not applicable.
   5. Extension arms: Same material and size as posts, welded to post tops at 45 degree angle, for attachment of barbed wire using clips and machine bolts.

C. Post Brackets:
   1. Galvanized steel and powder coated, sized to post dimensions, with stainless steel hardware.

D. Gates:
   1. Custom built by design. Includes any specified hardware.

2.3 ACCESSORIES

A. Concrete: As required by local building codes.

2.4 FINISHES

A. Fence Panels and Posts:
   1. Polyester powder coated to approximately 4 mils thickness, free of both Triglycidyl Isocyanurate (TGIC) and Volatile Organic Compounds, Black color.
   2. Adhesion: Tested to ASTM D3359, Method B.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fencing in accordance with manufacturer's instructions and approved Shop Drawings.
B. Drill post holes into undisturbed or compacted soil in accordance with local building codes.
C. Set posts with bottom hole in accordance with local building codes.
D. Place concrete around posts in accordance with local building codes.
E. Pour top of footings in accordance with local building codes.

3.2 INSTALLATION TOLERANCES

A. Maximum Variation from Plumb: ¼ inch in 10 feet.
B. Maximum Offset from True Position: 1 inch.

END OF SECTION 32 31 00

SECTION 32 91 00

LANDSCAPE PLANTING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Work covered under this Section includes all permit, fees, taxes, insurance, labor, materials, tools, equipment, and expertise to properly execute all work identified or implied by the Drawings and the Specifications.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1. Division 32 “Exterior Improvements” for seeding the Project.

1.02 QUALITY ASSURANCE

A. The Contractor shall provide, on site, an experienced foreman who shall be present al all times during the execution of the work, and who shall be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation. The foreman may not be replaced without the written permission of the Owner and Architect.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specifications Section 01 33 00.

B. Contractor shall submit proof of acquisition or securement of plant materials a minimum of sixty (60) calendar days prior to the planned date of commencement of planting.

C. The Contractor shall submit to the Architect Shop Drawings and or samples as required by the Drawings.

D. Submit photographs a minimum of sixty (60) calendar days prior to the planned acquisition of plant materials (not brochure photos) of actual plant material to be installed. Include a legible measuring device in photo so that size of material can be ascertained.

1.04 JOB CONDITIONS

A. Services for construction:

1. Water will be available at the site and is furnished by the Owner at no cost to the Contractor. Water transportation will be furnished by the Contractor.
2. The Contractor's attention is directed to the fact that there are active utilities located within the limits of work. Before commencing work, the Contractor shall familiarize himself with the layout and operation of all utility systems and shall protect from damage, all of their parts above and below ground. Any damage resulting from the Contractor's operations shall be immediately reported to the Owner and Architect. The Contractor shall be responsible for the cost of all repairs to utilities damaged by the Contractor.

B. The Contractor shall exercise care to protect existing work, buildings, trees, shrubs, lawns, etc. from any and all damage. Damage caused by the execution of the work by the Contractor shall be repaired to the satisfaction of the Owner at the expense of the Contractor.

C. It shall be the Contractor's responsibility to control and establish watering rates for all plant material and to conduct his activities in a clean, neat manner throughout the contract period. Sidewalks, streets, and other paved areas shall be continuously kept clean when planting and maintenance operations are in progress, and the entire area shall be cleaned at the end of each day's work.

D. The Contractor will provide watering for all plant material through the installation, maintenance and until landscape is acceptable to Owner and Architect.

1.05 GRADING & BACKFILLING

A. Fill Material: The Contractor will be responsible for achieving the finish grades shown on the grading plan (or as otherwise defined by these Specifications). The Contractor shall be responsible for fine grading (top 4") and preparation for planting. Such earth shall be topsoil, typical of the region, which shall be friable, natural topsoil, reasonably free of roots, rocks, weeds, and foreign matter. It shall not be handled in a muddy or frozen condition. Every effort shall be made to preserve organic matter.

B. Unsatisfactory Materials: If any of the topsoil brought in by the Contractor is determined by the Architect to be unsuitable for planting use, the material shall be removed and replaced as directed by the Architect.

C. Raking and Smoothing: The Contractor shall smooth and rake topsoil by machine and hand methods. Surfaces shall be first smoothed with a tractor and or hand drawn screen and then the entire surface shall be raked clean of roots and debris - providing a smooth surface which shall assure surface drainage away from buildings, walks, and curbs to drainage structures. All grading shall be approved by the Architect prior to planting.

PART 2 – PRODUCTS

2.01 PLANTING MATERIALS

A. Planting Soil: Any variation from this specification shall be fully described in writing by the Contractor and a sample approved on-site by the Architect.

1. Topsoil shall be fertile, friable, natural topsoil, brown in color and reasonably free of weeds and foreign matter. It shall not be handled in a muddy or frozen condition. Every effort shall be made to preserve organic matter.
2. Organic matter shall be peat humus (FS Q-P-166) and with texture and pH range suitable for intended use. Above components shall be mixed as follows: 1/3 Topsoil, 1/3 Organic Matter, and 1/3 Existing Soil (if suitable). The components shall be thoroughly mixed to a uniform consistency by hand or machine methods. Note: If existing backfill is deemed unsuitable, the planting soil mix shall consist of 50% topsoil and 50% organic matter.

B. Plants:

1. General: All plant material shall conform to or surpass minimum quality standards as defined by the American Association of Nurserymen, current edition of American Standards for Nursery Stock, 635-636 Southern Building, Washington, DC. In all instances, specifications outlined in the plant materials schedule take precedent.
2. Certificates of Inspection for Plant Materials: All necessary inspection certificates shall be supplied to the Architect for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with the Architect prior to acceptance of material.
3. Inspection: All plant material shall be subject to inspection and approval. The Architect reserves the right to reject any an all plant material which fail to meet this specification. All rejected plant material shall be removed from the site by the Contractor within seven days of

notification.

4. All plant material furnished shall be nursery grown, freshly dug, of normal habit, well branched, proportioned width to height, healthy and vigorous in growth, and shall have a well developed root system. All plants shall e true to species and variety. Plants used where symmetry is required shall match as nearly as possible.
5. Height and spread dimensions refer to the main body of the plant and not from branch tip to branch tip. The minimum acceptable sizes for plants measured before pruning with branches in normal position shall conform to measurements specified. Stock furnished in a size range specified shall mean not less than fifty percent and shall be of the maximum size specified within each range. Plants larger than specified may be used with the approval of the Architect at no additional cost to the Owner.
6. All plants shall be of healthy stock - free of diseases, insects, eggs, larvae, and parasites of an objectionable nature.
7. Availability and Substitutions: Substitutions for the plants specified will be accepted only when satisfactory evidence is submitted (in writing) to the Architect, showing that the plant material is not available. Requests for approval of substitutions of at least equivalent size and having essential characteristics similar to the originally specified material will be considered for approval.

C. Materials for Guying and Staking:

1. Stakes for supporting trees under two inch (2") caliper or multi-stem plants, shall be of sound timber, straight, uniform, sized as shown in the details, and of sufficient length to adequately support the plant. All stakes are to be painted dark gray.
2. Stakes for anchoring guy wires in the ground shall be #3 rebars as shown in the planting details and shall be of sufficient length to hold guy taut and maintain tree firmly in upright position.
3. Wire shall be #12 gauge galvanized wire in double twisted strands.
4. Hose shall be suitable lengths of new or used reinforced black rubber or plastic garden hose with a maximum diameter of one-half inch (½").
5. Wrapping material for tree with two inch (2") trunks, or larger, shall be standard crinkled paper cemented together with bituminous material in strips eight to ten inches (8" - 10") wide.
6. Twine for wrapping material shall be lightly tarred, medium coarse sisal yarn.

D. Additional Materials:

1. Mulch shall be clean, fresh, shredded pine bark and shall be free of branches, cones and foreign material, delivered to the site in bales or in bulk.
2. Fertilizer shall be Sta-Green Nursery Special, or equal delivered to the site in unopened containers.
3. Burlap for wrapping earth ball shall be made of jute and weigh not less than 7.2 ounces per square yard.

PART 3 – EXECUTION

3.01 PLANTING OPERATIONS

A. Preparation, Handling, and Digging:

1. Retain as by many fibrous roots as possible. Plants designated B&B shall be adequately balled wit firm natural balls of soils in sizes as specified in American Standards for nursery Stock. Balls shall be wrapped firmly in burlap and secured tied with heavy twine or rope.
2. Handle plants so that root systems and branches are adequately protected at all times from drying out. Plants that cannot be planted immediately on delivery shall be kept in the shade,

well protected with soil, wet moss, or other acceptable material, and shall be kept well watered. Plants shall not remain unplanted for longer than three (3) days after delivery.

3. Prepare plants for shipment in a manner that will prevent any damage to the branches, shape, or future development of the plant.
4. Do not remove container grown stock from their containers until planting time.
5. At least one plant of each species and variety specified shall have a securely attached waterproof tag bearing legible designation of botanical name and source.

B. Layout of Major Planting: The Contractor shall stake out all trees, shrubs, and ground cover beds indicated in the Drawings, for approval by the Architect, prior to the installation of Plant material. Plant material installed without approval will be relocated by the Contractor as directed by the Architect at the expense of the Contractor.

C. Planting Operations and Conditions: All plants, deciduous and evergreen, shall be planted at such times of the year as the job may require, with the agreement of the Contractor to guarantee the material as herein specified. Actual planting shall be performed only during periods when weather conditions are suitable.

D. Excavation for Planting Trees and Shrubs:

1. Circular plant pits wit vertical sides shall be dug by machine or hand methods as shown on the Drawings for planting trees and shrubs. Plant pit diameters shall be two (2) times greater than that of the spread of the root mass.
2. All tree pits must be loosened to a depth of two feet (2') below the bottom of the pit to such a depth that any hardpan has been broken up and moisture is allowed to move through freely. The Contractor shall fill each pit with water and observe the pit for a period of twelve (12) hours. If the water has not dissipated by fifty per cent (50%), the pit shall be drilled with a twelve inch (12") auger to a depth of four feet (4') below the bottom of the pit and filled with gravel. If in the opinion of the Contractor the drainage is still insufficient, the Contractor shall notify the Architect in writing prior to installing the plant material. Otherwise, the Contractor is deemed to be totally responsible for the guarantee and livability of the plant material.

E. Excavation for Planting Groundcover, Perennial, and Annual Color Beds:

1. Beds shall be scarified by hand or machine methods to a depth of twelve inches (12"). Two inches (2") of organic matter and twenty (20) pounds per one thousand (1,000) square feet of Sta-Green Nursery Special Fertilizer (or equal) shall be incorporated into the soil unless otherwise specified.
2. Seasonal color beds shall be scarified by hand or machine method to a depth of twelve inches (12"). Two inches (2") of organic matter and four (4) pounds per one hundred (100) square feet of 0-20-20 fertilizer shall be incorporated into the soil.
3. Under existing tree canopy scarification and preparation of groundcover and seasonal color beds shall be by hand methods only with extreme care being exercised to avoid damage to the existing tree roots.
4. Seasonal color beds shall be excavated to a depth of eighteen inches (18") below finish grade. Backfill with 50% topsoil and 50% organic matter and fertilizer (5-10-10, at the rate of ½ cup per square yard) shall be thoroughly worked into the planting soil mix.

F. Setting Trees and Shrubs:

1. All plants shall be set so that when settled they will occur approximately two to three inches (2"-3") above finish grade, (allow an additional two to three inches (2"-3") to compensate for settling). Each plant shall be planted neatly in the center of the pit.
2. Set plants plumb and brace rigidly in position until planting soil has been tamped solidly

around the ball and roots.

3. Balled and container plants shall be placed firmly upon scarified subgrade and backfilled with the planting soil mixture. Remove non deteriorating binder from root ball. Hand tamp carefully around and under ball to fill all voids. Water during backfilling. Form saucer from planting soil mix in order to retain water.
4. Repair any disturbed areas as necessary to return them to their original state.

G. Guying, Staking, Wrapping and Mulching:

1. Staking shall be completed immediately after planting. Plant shall be plumb after staking in accordance with the appropriate detail.
2. Guy trees over two inches (2") caliper. Space three (3) guys equally about each tree, attached at approximately two-fifths (2/5) of the trunk height and at a forth-five (45) degree angle and anchored in the ground with deadmen. Guy to trunks with wire loops and rubber hose drawn taut in all directions. Guys shall be equally taut. Safety flags shall be installed on all guy wires as detailed on the Drawings.
3. Trunks of deciduous trees larger than two inches (2") in caliper which are subject to sun scald, shall be wrapped spirally with standard paper or fiber wrapping material from the second branch down to the base of the trunk and the wrapping securely in place (only if required).
4. Stake trees less than two inches (2") in caliper with two (2) wooden stakes driven approximately one half (½) of trunk height. Stake to be one foot (1') from trunk, fastened at approximately two fifths (2/5) of trunk height with wire run through black rubber hose. Do not drive stakes through rootball.
5. Mulch all planting beds and other areas as designated with three inches (3") of fresh mulch. Individual plants are to be mulched as detailed.

H. Maintenance of Planted Areas:

1. Maintenance of new plantings shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guys, re-setting plants to proper grades or upright position, restoration of earth berm saucer, and furnishing, supplying, and applying such sprays as necessary to keep plantings free of insects and disease. If planting is performed after lawn areas have been prepared or installed, proper protection to these areas shall be provided. Any and all damage resulting from planting operations shall be promptly repaired.
2. Maintenance shall begin immediately after each plant is planted and shall be provided until the work is accepted by the Architect and Owner upon completion of all work under the Contract.
3. Planting areas and plants shall be protected at all times against trespassing and damage of any kind for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Architect at no additional cost to the Owner.
4. The root system of all plants shall be watered at such intervals as will keep the surrounding soil in the best condition for promotion of root growth and plant life.
5. All planting and plant materials required by this Contract shall be in a satisfactory and acceptable condition when the Contractor requests payment.

3.02 FINAL INSPECTION FOR ACCEPTANCE AT COMPLETION

A. A final inspection before Substantial Completion is signed will be made by the Architect within seven (7) days of written notification by the Contractor that in his opinion the work is 98% complete. If the Architect determines that the work is complete and acceptable, notification of the date of acceptance will be sent to the Contractor.

B. Upon Substantial Completion being signed it will be the Contractor's responsibility for maintenance is

ended, and adequate maintenance (including watering) becomes the sole responsibility of the Owner.

3.03 GUARANTEE, INSPECTION, AND REPLACEMENT

A. The Contractor's guarantee period begins the date of Substantial Completion.

B. Guarantee Period: All plant materials, lawn areas and construction covered by the Contract shall be guaranteed by the Contractor for a period of one (1) year from the date of Substantial Completion.

C. The Contractor shall furnish the Owner with a written detailed maintenance schedule for weeding, pruning, fertilizing, watering, etc., in order to ensure the Owner of the continued success of the planting. This schedule shall include sufficient instructions or each item so that the Owner will have a clear maintenance concept.

D. During the Guarantee Period the Contractor shall make frequent inspections of the Project to satisfy himself that the maintenance by the Owner is adequate. Any methods or products he deems not normal or detrimental to good plant growth shall be reported to the Owner in writing. Should the Contractor fail to inspect and report deficiencies to the Owner, in writing, the Contractor shall be held responsible for any and all necessary replacements and repairs.

3.04 INSPECTION AT THE TERMINATION OF THE GUARANTEE PERIOD

A. At the end of the guarantee period, inspection of the plant material will be made by the Architect upon written notice requesting such inspection submitted by the Contractor at least ten (10) calendar days prior to the Termination Date of the Guarantee Period. The Guarantee Period does not end until the Contractor contacts the Architect for this inspection.

B. The Contractor shall replace, without cost to the Owner, and as soon as the weather conditions permit, all dead plants not in vigorous thriving condition, as determined by the Architect during and at the end of one (1) year Guarantee Period. Replacements shall closely match adjacent specimens of the same species, and shall be subject to the selection in the field by the Architect prior to digging. Replacements shall be subject to the requirements stated in these specifications.

C. Replacement material shall be guaranteed for a period of one (1) year from the date of replacement.

D. The Contractor shall make all necessary repairs to grades, lawn areas, and paving required because of plant replacements. Such repairs shall be done at no cost to the Owner.

END OF SECTION 32 91 00

SECTION 32 92 00

TURF AND GRASSES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall include all permit fees, taxes, insurance, labor, materials, tools, equipment and expertise to properly execute all work identified or implied by the Drawings and Specifications for the implementation of all lawn areas.

B. Establish full vegetative cover on all lawn areas.

C. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 QUALITY ASSURANCE

A. The Contractor shall provide, on site, an experienced foreman who shall be present at all times during the execution of all work, and who shall be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation. The foreman may not be replaced without the written permission of the Owner and Architect.

1.03 JOB CONDITIONS

A. Services for Construction:
   1. Water shall be available at the site and is furnished by the Owner at no cost to the Contractor. Water Transportation will be furnished by the Contractor.
   2. The Contractor's attention will be directed to the fact that there are active utilities within the limits of work. Before commencing work, the Contractor shall familiarize himself with the layout and operation of all utility systems and shall protect from damage, all of their parts above and below ground. Any damage resulting from the Contractor's operations shall be immediately reported to the Owner and Architect. The Contractor shall be responsible for the cost of all repairs to utilities damaged by the Contractor.

B. The Contractor shall exercise care to protect existing work, buildings, trees, shrubs, trees, TURF AND GRASSES, etc. from any and all damage. Damage caused by the execution of the work by the Contractor shall be repaired to the satisfaction of the Owner at the expense of the Contractor.

C. It shall be the Contractor's responsibility to conduct his activities in a clean, neat manner throughout the contract period. Sidewalks, streets and other paved areas shall be continuously kept clean when planting and maintenance operations are in progress, and the entire work area shall be cleaned at the end of each day's work.

1.04 GRADING

A. Raking and Smoothing: The Contractor shall smooth and rake topsoil by machine and hand methods. Surfaces shall be first smoothed with a tractor and/or hand drawn screen and then entire surface shall be raked clean of roots and debris- providing a smooth surface which shall assure surface drainage away from buildings, walks, and curbs to drainage structures. All grading shall be approved by the Architect prior to planting.

PART 2 – PRODUCTS

2.01 LAWN MATERIALS

A. Seed for Maintained Lawn Areas shall be "Titan" Fescue Grass, or as otherwise specified on the Drawings. Seed shall be delivered to the site in sealed standard sized containers showing weight, name of vendor, and germination test. Seed shall be certified.

B. Fertilizer shall be Sta-Green Seed & Sod Fertilizer (18-24-10) or equal. It shall be uniform in composition, dry, free flowing, and shall be delivered to the site in the original, unopened containers each bearing the manufacturers guaranteed analysis. Fertilizer shall not have been exposed to weather prior to delivery to the site, and after delivery it shall be completely protected at all times until used. Fertilizer shall not be stored in direct contact with the ground.

C. Lime: Dolomitic lime shall be ground architectural limestone, free of impurities, delivered to the site either bagged or in bulk and protected from the weather. It shall not be stored in direct contact with the ground.

D. Topsoil: Topsoil shall be as defined in Specification Section 32 91 00 Landscape Planting.

E. Wood Fiber Mulch: Shall be virgin wood fiber mulch such as "Hydro-Mulch" by Conwed Fibers, Conover, NC or approved equal. On slopes 2:1 or greater the virgin wood fiber mulch shall be imbedded with tackifiers such as "Hydro Mulch 2000" by Conwed Fibers, Conover, NC or approved equal.

PART 3 – EXECUTION

3.01 PREPARATION

A. Distribution of topsoil shall be as defined in Specification Section 32 91 00 Landscape Planting and have achieved approximate finished grade.

B. Contractor shall prepare a good crumbly seed bed that is tilled four to six inches (4-6") deep, well firmed after tilling, and well leveled. Fine grade lawn areas to achieve proper surface drainage and to finish grade. Where no grades are indicated, areas shall have a smooth and continual grade between fixed controls such as walks, curbs, etc. and elevations shown. Rake level as necessary to obtain true, even lawn surfaces. All finish grades shall meet the approval of the Architect prior to seeding.

C. Approximately two (2) days prior to seeding, apply lime at a rate necessary to provide a neutral pH over the area to be seeded. Work lime into the top four inches (4") of topsoil.

D. Broadcast fertilizer uniformly at the rate of 1200 pounds per acre over newly prepared soil and work into top three quarter inches (3/4") of topsoil.

E. After all materials have been worked in, firm up the soil by rolling to assure that no soft spots remain that will settle in the future.

3.02 SEEDING OPERATIONS

A. Seed shall be sown within 24 hours following application of fertilizer and lime and soil preparation.

B. Seeding Operations:

1. Rake the surface of areas to be seeded with a wide toothed rake or tine-harrow into a crumbly state with about one inch (1") of loose soil at the surface.
2. Seeding rate shall be 10 pounds per 1000 square feet.
3. All seeded lawn areas shall be hydroseeded. Seed and fertilizer, at the specified rates, shall be mixed with virgin wood fiber mulch at the rate of 1200-1500 pounds per acre and shall be evenly distributed over the area to be seeded in the form of a slurry. Equipment for mixing and applying the slurry shall be especially designed for this purpose, and shall be capable of applying a uniform mixture over the entire area to be seeded. The slurry mixture shall be agitated during application to keep the ingredients thoroughly mixed. All materials shall be discharged within one hour after being combined in the hydroseeder. Hydroseeding shall not be performed when winds prevent an even, thorough application.
4. Water lightly to assure good adhesion to the soil. Additional mulch (such as fresh wheat straw 3/4" - 1 1/2") applied lightly and in accordance with GA. DOT specifications shall be at the Contractor's discretion. The Contractor is responsible for insuring 100% coverage in all seeded lawn areas.
5. Water newly seeded area two to three (2-3) times daily until the lawn is well established (approximately 30 calendar days).

3.03 LAWN MAINTENANCE AND REPAIR

A. Maintenance of all lawn areas shall consist of watering, weeding, cutting, repair of any erosion, and re-sodding/seeding as necessary to establish a uniform stand of the specified grass, and shall continue until the work has been accepted by the Owner.

B. All lawn areas shall be protected until accepted (at least through the first mowing). All eroded and damaged areas, regardless of cause, shall be immediately repaired and re-sodded/seeded. Protect all lawn areas from traffic.

C. When TURF AND GRASSES have become established as required above, a final inspection of the lawn work will be made upon completion of the total job. If the work is found to be satisfactory and in accordance with all the requirements of the Drawings and Specifications, the work shall be accepted.

3.04 PLANTING OPERATIONS AND CONDITIONS

All seed and sod shall be planted/installed at such times of the year as the job may require, with the agreement that the Contractor to guarantee the material as herein specified. Actual planting shall be performed only during periods when weather conditions are suitable.

END OF SECTION 32 92 00

SECTION 33 10 00

WATER UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers complete installations of outside utilities except storm and sanitary sewers.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1. Division 31 “Earthwork” for grading.
2. Division 31 “Earthwork” for erosion and sedimentation control.
3. Division 31 “Earthwork” for excavating.
4. Division 33 “Utilities” for storm and sanitary sewers for gravity sewers.
5. Division 03 “Concrete” for concrete work.

C. The work here implied and shown shall be performed by a Contractor qualified to perform such work licensed by the State of Georgia.

1.02 QUALITY ASSURANCE

A. Testing Agency: Samples and tests, as required, are to be made by an independent testing laboratory provided by the Owner.

B. Allowable Tolerances: Allowable dimensional alignment for WATER UTILITIES shall be as follows:

Vertical: +0.10 feet (30 mm)
Horizontal: +0.50 feet (150 mm)

C. All water system standards shall refer to Clayton County Water Resources latest Standards.

D. Georgia Department of Transportation Standards for Roads and Bridges, latest edition.

E. Factory Mutual (FM) Research Approval Guide.

F. Underwriters Laboratory (UL) Approval Guide.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specification Section 01 33 00.

B. Shop Drawings: Shop Drawings shall include:

1. Water meter, double detector check, backflow preventer, water valves, water service pipes and fittings, fire hydrants, and water vault.
2. Certificates: Provide manufacturer's certificates of compliance and/or testing reports including UL/FM approval of pipe, valves, pumps, controls and castings.

1.04 JOB CONDITIONS

A. Have all utilities marked, verify horizontal and vertical locations. Call Utility Protection Center at 811. Connect utilities to building services at a point 5 feet (1.5 m) outside building unless otherwise indicated. Work shall be in conformance with local codes, ordinances and utility companies.

B. Protection of Existing Utilities Structures.

1. Protect existing utilities shown on Drawings, or locations of which are known prior to excavation, from damage during excavation and backfilling of trenches, and if damaged, repair them at no expense to the Owner. Any existing line or utility structure which is not shown on Drawings or location of which is not made known in sufficient time to avoid damage, if inadvertently damaged, shall be repaired by the Contractor and adjustment in payment will be made in accordance with Specification Section 01 25 00. In any event, make repairs under supervision of the utility concerned.

C. Removal of Utilities.

1. Utilities indicated to be removed or abandoned shall be removed or abandoned in accordance with regulations and requirements of governing utility or code authority.

D. Gas Service.

1. General. Gas service system is intended for distribution of natural gas, and materials, appurtenances and workmanship used in system shall be suitable for accomplishment of this purpose.
2. Gas Service. Service mains, gas regulators, gas meters, and tapping of existing mains shall be furnished and installed by local gas company.

PART 2 – PRODUCTS

2.01 MIXES

A. Concrete. All concrete shall have 3000 PSI (20.7 megapascal) 28 days compressive strength, air entrained and conform to ASTM C 94.

2.02 FABRICATION AND MANUFACTURE

A. Domestic Water Service.

1. All components of the water system shall comply with the requirements of the Clayton County Water Resources.

2. Pipe and Fittings.
   a. Ductile Iron Pipe. Conform to AWWA standard C-151. Pipe and fittings shall be cement lined in accordance with AWWA standard C-104. Fittings shall conform to AWWA standard C-110, 350 PSI pressure rating, standard outside coating and cement mortar lining. Joints shall conform to AWWA standard C-111, mechanical or push-on joints.
   b. Copper Tubing shall conform to ASTM B 88, Type K. Fittings shall conform to ANSI B16.15 and AWWA C-800.
   c. Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 80.

3. Valves.
   a. Gate valves shall have joint ends to fit the type of pipe used, and be opened by turning to the left. Valves to conform to AWWA C-509.

4. Fire Hydrants. Fire hydrants shall have a 6 inch (150mm) connection to the main and shall have two 2-1/2 inch (63mm) hose connections and one 4-1/2 inch (115mm) pumper

connection. The hose threads shall conform to the local standards. The Contractor is responsible to secure the required thread specifications.

a. The hydrants shall conform to AWWA C-502 and shall comply with all requirements of the Clayton County Water Resources. Design, material and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Paint hydrants one coat of primer and two finishing coats of paint of color and type selected by the Architect. Hydrants shall have valve openings of not less than 5 inches (125 mm). Hose nipples shall be bronze with connections compatible to those of local fire department.

PART 3 – EXECUTION

3.01 EXCAVATION

A. General. Perform excavation of every description and of whatever substances encountered, to depths indicated on Drawings. During excavation, deposit material suitable for backfill in an orderly manner a sufficient distance from excavation banks to avoid overloading and to prevent slides or cave-ins. Waste material unsuitable for backfill as directed by the Geotechnical Engineer. Grade as necessary to prevent surface water from flowing into trenches or other excavations, and remove water accumulating therein by pumping or by other acceptable method. Unless otherwise specified, excavation shall be by open cut. Keep banks of trenches and excavation for structures as nearly vertical as practicable and where required, properly sheet and brace. Fill unauthorized excess excavation below levels indicated for structures or pipe with sand, gravel or concrete.

B. Trench Excavation. Excavate true to line to elevation at least 2 feet (600 mm) above top of pipe to provide clear space of not less than 6 inches (150 mm) nor more than 8 inches (200 mm) on either side of pipe. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length, except for portions of pipe sections where it is necessary to excavate for proper sealing of pipe joints. Bell holes and depressions for joints dug after trench bottom has been graded, and in order that pipe rest upon prepared bottom for as nearly its full length as practicable, to be only of such length, depth and width as required for properly making particular type of joint. Replace material excavated beneath pipe entering and leaving manholes with concrete and extend such concrete fill to center of pipe for distance of at least 3 feet (1 m) from face of manhole and terminate at a joint.

C. Rock Excavation. Where rock is encountered, carry excavation to depth of at least 6 inches (150 mm) below bottom of pipe. No part of trench excavations shall be carried more than 12 inches (300 mm) below bottom of pipe. Backfill trench with selected loose, moist earth and compact to provide proper bedding for pipe. Rock encountered is part of the work and shall not be considered for additional payment.

D. Unsuitable Material. Where bottom of trench is found to be unstable or to include ashes, cinders, refuse, vegetable or other organic material, or large pieces of fragments of inorganic material, which in judgment of the Geotechnical Engineer, should be removed, excavate and remove such unsuitable material to minimum depth of 6 inches (150 mm) below pipe. Backfill trench with selected bedding material and compact to provide uniform and continuous bearing for pipe. Dispose of unsuitable material.

E. Shoring Requirements. Perform shoring and sheeting that is required to protect excavation and to safeguard employees. Widen excavation to provide for space occupied by shoring and sheeting.

F. Tunnel Excavation. Perform tunneling and/or jacking methods of excavation at locations indicated on Drawings. Operations in connection with tunnel excavation shall be responsibility of the Contractor. Special care shall be taken to protect pipe, existing structures above or below ground and employees. Repair damage promptly.

G. Open Cut. Open cuts of pavement in the right of way shall conform to Clayton County requirements. All fees for performing open cuts in the right of way shall be paid for by the Contractor prior to receiving the permit to perform work in the right of way. These fees may be refundable if repair work meets Clayton County requirements.

3.02 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Domestic Water Service

1. Pipe. Install ductile-iron pipe in accordance with all applicable requirements of AWWA standard C-600. Install cooper tubing with brass fittings in accordance with manufacturer's recommendations. Install PVC pipe in accordance with AWWA C-900 and as recommended by the manufacturer. Pipe under and to 4 feet outside of paved areas shall be sleeved in Schedule 40 PVC.
2. Setting Hydrants, Valves and Valve Boxes. Install hydrants, valves and valve boxes in the lines, plumb, and centered with valve boxes placed directly over the valves. Carefully tamp earth fill around the valve box to a distance of 4 feet (1.2m) on all sides of the box, or to the undisturbed trench face if less than 4 feet (1.2mm). Clean hydrant and valve interiors before installation. Inspect the hydrant or valve in opened and closed positions. Set hydrants at such elevations that the connecting pipe will have the same depth of cover as the distributing mains and with the nozzles at least 18 inches (450mm) above the ground. The back of the hydrant shall be firmly wedged against the vertical face of the trench. If the character of the soil is such that the hydrant cannot be securely wedged, use bridle rods and rod collars, which shall be not less than 3/4 inch (20 mm) stock and shall be protected by a coat of acid around the base of the hydrant to insure drainage with at least 6 inches (150 mm) of broken stone above the drainage outlet on the hydrant. Connect all hydrants to the main with 6 inch pipe (150 mm) and have a 6 inch (150 mm) valve installed between the main and the hydrant unless otherwise noted. Thoroughly compact the entire backfill around the hydrant.
3. Thrust Restraint. Install concrete thrust blocks at tees and elbows in water service lines to prevent fittings from being blown off lines when under pressure. Same can be accomplished by using metal restraining tie rods or using restrained joints for pipes. For details see NFPA Standard 24, Outside Protection, Appendix B.
4. Water Service Sterilization. Each unit of completed water service must be sterilized in accordance with AWWA C-651.

3.03 BACKFILL

A. General. Do not backfill until required inspections are made and tests are performed. Backfill with excavated materials specified for backfilling, consisting of earth, loam, sandy clay, sand and gravel or other materials, free from large clods of earth or stones. Broken concrete shall not be used as backfill material. No backfilling shall take place in freezing weather, and no backfill shall be made with frozen material. Adjust moisture content of backfill material if required for proper compaction. Reopen any trenches improperly backfilled, or where settlement occurs, to depth required for proper compaction, refill and compact to specified density. Compact backfill for structures to specified density.

B. Around pipe. Deposit suitable backfill material under haunches of pipe in 6 inch (150 mm) layers and thoroughly compact backfill to at least 90 percent of maximum density at optimum moisture content determined by ASTM D 698 until pipe has minimum cover of 1 foot (300 mm) for water and gas mains. Moisture content of soil at time of compaction shall be not more than 3 percent above or 3 percent below optimum. Be careful not to disturb pipe. Carry backfilling on simultaneously on both sides of pipe to eliminate possibility of lateral displacement.

C. Remainder of Trench. Deposit remainder of suitable backfill material in layers not exceeding 12 inches (300 mm) in loose depth and thoroughly compact them to at least 95 percent of maximum density at optimum moisture content determined by ASTM D 698, except compact top 2 feet (300 mm) of backfill below paving base or subgrade in areas to be paved to at least 98 percent of maximum density at optimum moisture content determined by ASTM D 698. Moisture content of soil at time of compaction shall be not more than 4 percent above or 4 percent below optimum.

D. Crushed Rock Bedding. Where selected bedding material is required by Drawings or by Architect during construction to replace unsuitable foundation material, crushed rock bedding shall be used. Bedding material shall consist of crushed rock mechanically or naturally combined with screenings from crusher operations or other finely divided mineral matter having similar physical properties. Composite material to be free from organic or other objectionable matter and to consist of angular, sound and durable fragments, reasonably uniform in density and quality, and free from thin and elongated pieces. Minimum depth between bottom of trench and lowest point of pipe shall be 4 inches (100 mm) or one eighth of outside diameter of pipe, whichever is greater.

1. Crushed rock shall be well graded with maximum size of 2 inches (50 mm). Not more than 20 percent by weight shall pass No. 4 (4.75 mm) sieve and shall not contain more than 3 percent by weight of particles smaller than 20 micrometer grain size as determined by ASTM Standard D 422.

E. Improved bedding where required by Drawings shall consist of granular material (sand, crushed rock, etc.) or concrete cradle as indicated. Granular material shall be free from organic or other objectionable material and shall conform to grading requirements for either fine or coarse aggregate as set out in Specification Section 03 30 00 Cast-in-Place Concrete.

3.04 FIELD QUALITY CONTROL

A. Testing and Inspection.

1. Water Lines.
   a. Pressure Test. After pipe is laid, joints completed, and trench partially backfilled, leaving joints exposed for examination, newly laid pipe or any valved section of piping shall, unless otherwise specified, be subjected to pressure test of 50 percent in excess of expected operating static pressure at points of reading. Perform pressure test in accordance with requirements of AWWA Standard C-600.
   b. Leakage Test. Perform leakage test in accordance with requirements of AWWA Standard C-600.
   c. Manufacturer's certificate of compliance or certified analysis will be required for each shipment of material used. Perform tests in accordance with the requirements of ANSI A21.6 or A21.8.
2. Backfill.
   a. Maximum Density Determination. Make tests on two separate samples to determine maximum density at optimum moisture content. Samples to be taken where directed by the Geotechnical Engineer. Findings of these tests to be filed with the Geotechnical Engineer and Architect in triplicate.

b. Compaction Tests. Take compaction or in-place density tests at location and time requested by the Geotechnical Engineer. Backfill not meeting requirements specified shall be removed, replaced, recompacted and retested for compaction at expense of Contractor. Findings of these tests shall be filed with Geotechnical Engineer and Architect in triplicate.

END OF SECTION 33 10 00

SECTION 33 40 00

STORM AND SANITARY SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers the complete installation of all storm and sanitary septic systems.
   1. All storm and sanitary septic systems shall be constructed to the locations shown on the Drawings.
   2. All Work shall be in conformance with the requirement of local codes and ordinances.

B. Related Work Specified Elsewhere: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.
   1. Division 31 “Earthwork” for grading.
   2. Division 31 “Earthwork” for erosion and sedimentation control.
   3. Division 31 “Earthwork” for excavating and filling.
   4. Division 33 “Utilities” for other exterior utilities.
   5. Division 03 “Cast-in-Place Concrete” for concrete specifications.

1.02 QUALITY ASSURANCE

A. Testing Agency: Samples and tests, as required, are to be made by an independent testing laboratory provided by the Owner.

B. Allowable Tolerances: The allowable dimensional alignment for gravity sewers shall be:
   1. Minimum 1% slope, unless otherwise shown on the Drawings.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Specifications Section 01 33 00.

B. Shop Drawings: Shop Drawings shall include:

C. Storm sewer pipe and fittings.

D. Sanitary sewer pipe and fittings.

E. Cast or ductile iron castings.

F. Manholes, sand filter, and oil water separator.

G. Outlet control structure.

H. Certificates: Provide manufacturer's certified analysis or certificate of compliance shall be furnished for all shipments of pipe, cast iron frames, grates and covers, valves and other miscellaneous material required under this Section of the Specifications.

I. Sanitary Sewer Record Drawings - Reference PART 3, Paragraph 3.05 of this section.

1.04 JOB CONDITIONS

A. Connect all sewers to the building service at a point five (5) feet (1.5 m) outside the building unless otherwise indicated. All Work shall be in conformance with the requirement of local codes, ordinances, and utility companies.

B. Protection of Existing Utilities Structures
1. Have all utilities marked, verify horizontal and vertical locations. Call Utility Protection Center at 811. Protect the existing utilities shown on the Drawings or the locations of which are known prior to excavation, from damage during excavation and backfilling of trenches, and if damaged, repair them at no expense to the Owner. Any existing line or utility structure which is not shown on the Drawings or the location of which is not made known in sufficient time to avoid damage, if inadvertently damaged, shall be repaired by the Contractor and adjustment in payment will be made in accordance with Specification Section 01 25 00. In any event, make repairs under the supervision of the utility concerned.

C. Removal of Utilities
1. All utilities indicated to be removed or abandoned shall be removed or abandoned in accordance with the regulations and requirements of the governing utility or code authority.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Brick. Brick for manholes shall conform to ASTM C 32, Grade SS or SM.

B. Concrete. All cast-in-place concrete shall have 3000 psi (20.7 megapascal) 28 days compressive strength, air entrained and shall conform to ASTM C 94 for ready mixed concrete.

C. Cement. Cement for sanitary sewer manholes shall be Type II, conforming to ASTM C 150.

D. Mortar and Plaster. Mortar and plaster for masonry manholes shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in the amount of not more than 25 percent of the volume of cement.

E. No. 57 stone septic trench backfill.

2.02 FABRICATION AND MANUFACTURE

A. Sanitary Sewer:
1. Pipe.
a. Ductile Iron Pipe. Conform to the provisions of AWWA C151 with the standard coating and a cement mortar lining in accordance with AWWA C104 and Clayton County Water Resources.
b. Type PSM poly (vinyl chloride) (PVC) sewer pipe and fitting conform to ASTM D 3034, SDR 35 and Clayton County Water Resources.
2. Pipe Joint.
a. Ductile iron pipe joints. Conform to AWWA C111 and City of Gainesville Department f Water Resources.
b. PVC sewer pipe and fittings. Use elastomeric gasket joints, the assembly of which shall be in accordance with ASTM D 3212 and Clayton County Water Resources.

B. Storm Sewer:
1. Pipe.
a. Reinforced Concrete Pipe (RCP). Conform to GADOT Section 843.
b. Corrugated Metal Pipe (ACCMP) for bituminous coated pipe and base metal conform to AASHTO standard M36 and AASHTO designation M-190 Type A. The gage of the base metal is detailed on the Drawings, or aluminized corrugated pipe.
c. Polyvinyl Chloride Pipe (PVC) shall be Schedule 40 PVC.
d. High density plastic pipe (HDPE) as manufactured by Crumpler Pipe or Hancor Pipe -

see location of pipe and details as shown on the Drawings.

2. Pipe Joints.
   a. Concrete and reinforced concrete pipe joints shall be installed with rubber gaskets conforming to ASTM Standard C 443. The gaskets shall be designed specifically for the pipe being installed, i.e., tongue and groove, bell and spigot, recessed groove, etc.
   b. Corrugated metal pipe joints shall be made with connecting bands conforming to AASHTO standard M36. In addition, the connecting bands shall be bituminous coated as specified for the pipe.

C. Reinforcing steel. Reinforcing steel to be deformed bars except where otherwise noted on plans and conform to ASTM A 615, Grade 40.

D. Manhole and inlet steps. Where required, provide manholes and inlets with steps equal to M.A. Ind. Inc., #PS-1 or #PS-1-PF as approved by Clayton County Water Resources, not less than 10 inches (250 mm) in width built into and thoroughly anchored in the walls and spaced uniformly approximately 12 inches (300 mm) apart. Steps will not be required unless the depth from cover of manhole or inlet to invert of main sewer exceeds 4 feet (1.22 m).

E. Manhole and cleanout frames and covers and inlet gratings. Provide cast iron conforming to ASTM A 48, Class 30. All castings to be true to pattern, in forms and dimensions, free from faults, sponginess, cracks, blowholes and other defects affecting their strength. Bearing surfaces between frames and covers to be machined, fitted together, and match-marked to prevent rocking.

F. Precast reinforced concrete manhole sections shall conform to ASTM C 478.

PART 3 – EXECUTION

3.01 EXCAVATION

A. General. Perform all excavation of every description and of whatever substances encountered, to the depths indicated on the Drawings. During excavation, deposit material suitable for backfill in an orderly manner a sufficient distance from the excavation banks to avoid overloading and to prevent slides or cave-ins. Waste material unsuitable for backfill as directed by Architect. Grade as necessary to prevent surface water from flowing into trenches or other excavations, and remove any water accumulating therein by pumping or by other acceptable method. Unless otherwise specified, all excavation shall be by open cut. Keep the banks of trenches and excavation for structures as nearly vertical as practicable and where required, properly sheet and brace. Fill any unauthorized excess excavation below the levels indicated for structures or pipe with sand, gravel or concrete.

B. Trench Excavation. Excavate true to line to an elevation a minimum of 3' above the top of pipe to provide a clear space of not less than 6 inches (150 mm) nor more than 8 inches (200 mm) on either side of the pipe. Grade the bottom of the trenches accurately to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for the proper sealing of pipe joints. Bell holes and depressions for joints dug after the trench bottom has been graded, and in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable, to be only of such length, depth and width as required for properly making the particular type of joint. Replace any material excavated beneath pipe entering and leaving manholes and inlets with concrete and extend such concrete fill to the center of pipe for a distance of at least 3 feet (1 m) from face of manhole and inlet and terminate at a joint.

C. Rock Excavation. Where rock is encountered, carry the excavation to a depth of at least 6 inches (150 mm) below the bottom of the pipe. No part of trench excavations shall be carried more than 12 inches (300 mm) below the bottom of the pipe. Backfill the trench with selected loose, moist earth and

compact to provide proper bedding for the pipe. Rock removal is part of the work and shall not be considered for additional payment.

D. Unsuitable Material. Where the bottom of the trench is found to be unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material, or large pieces or fragments of inorganic material, which in the judgment of the Architect, should be removed, excavate and remove such unsuitable material to a minimum depth of 6 inches (150 mm) below the pipe. Backfill the trench with selected bedding material and compact to provide uniform and continuous bearing for the pipe. Dispose of the unsuitable material.

E. Shoring Requirements. Perform all shoring and sheeting that is required to protect the excavation and to safeguard employees. Widen excavation to provide for space occupied by shoring and sheeting.

3.02 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Pipe.

1. Laying Pipe. Shape the bottom of the trench by hand to give substantially uniform circumferential support to the lower fourth of each pipe. Where applicable, pipe laying shall proceed upgrade with the tongue or spigot ends pointing in the direction of the flow. Each pipe to be laid true to line and grade indicated on the Drawings and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. As the work progresses, clean the interior of the sewer of all dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe size, keep a suitable swab or drag in the pipe and pull forward past each joint immediately after the joining has been completed. If the maximum width of the trench at the top of the pipe as specified is exceeded, install, such concrete cradling, pipe encasement or other bedding as may be required by the Architect to support the added load of the backfill. Keep trenches for all sections of the sewer free from water until the pipe-jointing material has set and the trench backfilled. Do not lay pipe when the condition of the trench or the weather is unsuitable for such work. At times when the work is not in progress, keep open ends of pipes and fittings securely closed so that no trench water, earth or other substance will enter the pipe or fittings. When conditions are such that the pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase the pipe in concrete or support it on a concrete cradle. Thermoplastic sewer pipes shall be installed in accordance with ASTM D 2321.
2. Pipe Joints.
    a. Cast iron pipe or ductile iron pipe. Install cast iron or ductile iron pipe in accordance with the provisions of AWWA C-600, except that provisions relating only to pipe under pressure, such as thrust restraint, hydrostatic testing etc., or to disinfection, need not be followed. Encase all cast or ductile iron pipe in 8-mil thick polyethylene film in accordance with AWWA C-105.
    b. Concrete and reinforced concrete pipe. Install the rubber gaskets in accordance with the recommendations of the joint manufacturer.
    c. Corrugated metal pipe or smooth interior corrugated metal pipe. Installation and joining or connecting shall be performed in accordance with the recommendations of the pipe manufacturer. Repair all materials on which the coating has been bruised or damaged during shipment or installation by the application of the same bituminous material used for shop coating the pipe or other suitable material.
    d. PVC Pipe. Install in strict accordance with ASTM D 2321.
3. Connection to existing pipe. Make connections to existing pipe by the use of one of the joints described above where possible to do so. Where the end of the existing pipe is broken or a standard joint is otherwise impracticable, install a concrete collar to make the connection.
4. Connection to Existing Manholes. Make pipe connections to existing manholes in such a manner that the finished work will conform as nearly as practicable to the essential applicable requirements for new manholes, including all necessary concrete work, cutting and shaping.

5. Wye Branches. Install commercially manufactured wye branches where indicated on the plans. Cutting into the pipe for connections will not be permitted except in special cases reviewed by the Architect.
   a. Pipe Plugs. Plug all open ends of wye branches with a manufactured stopper installed in accordance with provisions for jointing. Plug open ends of sewer pipe with a manufactured stopper or concrete masonry. Concrete masonry plugs shall have a minimum thickness of 4 inches (100 mm). Install all plugs in such a manner that the open end of the pipe is permanently sealed but can be removed for future extensions without damaging the pipe.

B. Manholes.
   1. General. Construct manholes of precast concrete with cast iron frames and covers, and in accordance with the Drawings. Precast reinforced concrete manholes shall conform to ASTM C 478. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of the manhole will permit. Make changes in size and grade of the channels gradually and evenly. The invert channels may be formed directly in the concrete of the manhole base, or shall be built up with brick and mortar or may be half tile laid in concrete, or may be constructed by laying full-section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than 1 inch per foot (80 mm per m) nor more than 2 inches per foot (160 mm per m). Any material excavated beneath pipe entering and leaving manholes and inlets shall be replaced with concrete. Such concrete fill shall extend to the center of pipe for a distance of at least 3 feet (1 m) from face of manhole and inlet and shall terminate at a joint.
   2. Jointing and Plastering. Fill mortar joints completely and make them smooth and free from surplus mortar on the inside of the manhole. Plaster brick manholes with half inch (12 mm) of mortar over the entire outside surface of walls. Lay brick radially with every sixth course laid as a stretcher course. When precast concrete manhole sections are used, set each section in a fresh bed of mortar to make a mortar joint with a minimum thickness of 1/8 inch (3 mm). Point up all joints inside and out.
   3. Frames and Covers. Set the cast iron manhole frame in a bed of mortar and carefully adjust to the elevations shown on the Drawings.
   4. Inspection manholes, branch connections and elbows on large diameter pipe shall be built to conform to details indicated on the Drawings.

C. Inlets and Junction Boxes. Construct inlets and junction boxes of the materials and to the exact dimensions and grades shown on the Drawings. Finish surfaces smooth and true. Expansion joint filler shall be preformed bituminous treated fiberboard conforming to ASTM D 994, Type III.

D. Headwalls. Construct headwalls of the materials and to the exact dimensions and grades shown on the Drawings. Finish surfaces smooth and true.

E. Rock Riprap. Place Riprap at the ends of pipe and in open ditches at the locations and to the lines and dimensions indicated on the Drawings. Place the riprap material on prepared areas by hand, to form a smooth surface. All pieces shall be in close contact and have a firm and even bearing on the soil and not wholly on the riprap material below. Fill the spaces between the larger stones with stones of suitable size so placed as to leave a surface capable of shedding water to the maximum degree practically obtainable.

F. Backfill.
   1. General. Do not backfill until all required inspections are made and tests are performed. Backfill with the excavated materials specified for backfilling, consisting of earth, loam, sandy clay, sand and gravel or other materials, free from large clods or earth or stones. Broken concrete shall not

be used as backfill material. No backfilling shall take place in freezing weather, and no backfill shall be made with frozen material. Adjust the moisture content of the backfill material if required for proper compaction. Reopen any trenches improperly backfilled, or where settlement occurs, to the depth required for proper compaction, refill and compact to specified density. Compact all backfill for structures to the specified density.

2. Around Pipe. Deposit suitable backfill material under the haunches of the pipe in 6 inch (150 mm) layers and thoroughly compact. Backfill to at least 90 percent of maximum density at optimum moisture content determined by ASTM D 698 until the pipe has a minimum cover of 2 feet (600 mm). The moisture content of the soil at time of compaction shall be not more than 3 percent above or 3 percent below the optimum. Be careful not to disturb the pipe. Carry backfilling on simultaneously on both sides of the pipe to eliminate the possibility of lateral displacement.
3. Remainder of Trench. Deposit the remainder of the suitable backfill material in layers not exceeding 12 inches (300 mm) in loose depth and thoroughly compact them to at least 95 percent of maximum density at optimum moisture content determined by ASTM D 698, except compact the top one foot (300 mm) of backfill below the paving base or subgrade in areas to be paved to at least 98 percent of maximum density at optimum moisture content determined by ASTM D 698. The moisture content of the soil at the time of compaction shall be not more than 4 percent above or 4 percent below the optimum.
4. Crushed Rock Bedding. Where selected bedding material is required by the Drawings or by the Architect during construction to replace unsuitable foundation material, crushed rock bedding shall be used. The bedding material shall consist of crushed rock mechanically or naturally combined with screenings from crusher operations or other finely divided mineral matter having similar physical properties. The composite material to be free from organic or other objectionable matter and to consist of angular, sound and durable fragments, reasonably uniform in density and quality, and reasonably free from thin and elongated pieces. The minimum depth between the bottom of the trench and the lowest point of pipe shall be 4 inches (100 mm) or one eighth of the outside diameter of pipe, whichever is greater.
5. The crushed rock shall be well graded with a maximum size of 2 inches (50 mm). Not more than 20 percent by weight shall pass a No. 4 (4.75 mm) sieve and shall not contain more than 3 percent by weight of particles smaller than 20 micrometre grain size as determined by ASTM Standard D 422.
6. Improved bedding where required by the Drawings shall consist of granular material (sand, crushed rock, etc.) or a concrete cradle as indicated by the Drawings. Granular material shall be free from organic or other objectionable material and shall conform to the grading requirements for either fine or coarse aggregate as set out in Specification Section 03 30 00, Cast-in-Place Concrete. Concrete shall conform to requirements of Specification Section 03 30 00, Cast-in-Place Concrete, except that the cement content may be reduced to 5 sacks per cubic yard (300 kg per cubic m) and may be either Type I or Type II.

3.03 FIELD QUALITY CONTROL

A. Testing and Inspection.

1. Sanitary and Storm Sewers:
   a. General. Inspect all sewer lines by checking each section between manholes for alignment. A full circle of light shall be seen by looking through the pipe at a light held at the opposite end of the Section of sewer line being inspected. Make any corrections required in line or grade. The Contractor shall furnish the material samples for testing. Costs for tests shall be as covered in as part of the Contract Price. The following tests will be required.
   b. Concrete and materials for concrete shall be tested in accordance with the requirements of Specification Section 03 30 00 Cast-in-Place Concrete.
   c. Infiltration. Leakage into the sanitary sewers shall not exceed a rate of 10 gallons (15 1) per day per inch (centimeter) of diameter per 100 feet (30 m) of sewer for any section

between successive manholes. If, in the opinion of the Architect, infiltration appears excessive, the amount of leakage shall be measured by a suitable weir or other device as directed by the Architect and at the Contractor's expense. When the infiltration exceeds the specified amount, correction shall be made to the satisfaction of the Architect. Sanitary lines shall be air tested and television inspected as required by Clayton County Water Resources).

2. Backfill:
   a. Maximum Density Determination. Make tests on two separate samples to determine the maximum density of optimum moisture content. Samples shall be taken where directed by the Architect. Findings of these tests to be filed with the Architect in triplicate.
   b. Compaction Tests. Take compaction or in-place density tests at location and time requested by the Architect. Backfill not meeting the requirements of Specification Section 31 23 00 Excavating and Fill shall be removed, replaced, re-compacted and retested for compaction at the expense of the Contractor. Findings of these tests shall be filed with the Architect in triplicate.

3.04 ADJUSTMENT AND CLEANING

A. Pavement Repair

1. Where necessary to cut pavements, drives, sidewalks or other permanent surfaces, the cuts shall be made with neat lines at least 1 foot (300 mm) wider than the trench. Cut material shall be disposed of by the Contractor.
   a. The surfaces that are cut shall be restored to a condition at least equivalent to the condition existing before the cut was made. The Contractor shall cooperate at all times to keep streets open for use and also shall cooperate to keep portions of driveways open for use.
2. Concrete for repair work shall be as specified in Specification Section 03 30 00 Cast-in Place Concrete. Concrete shall be finished to match surrounding surfaces as nearly as possible.
3. Asphaltic concrete for repair work shall be as specified in Specification Section 32 12 00 Flexible Pavement.

3.05 RECORD DRAWINGS (“AS-BUILTS”)

A. Sanitary Sewer System “as-built” Drawings

1. Contractor to employ the services of an engineering/surveying firm with Georgia Registered Engineers and Georgia Registered Land Surveyors to provide Record Drawings of the storm sanitary sewer water distribution and fire protection systems installed by the Contractor.
   a. Said “as-built” or Record Drawing(s) shall show all horizontal and vertical locations of sanitary, storm sewer and all other utilities and shall conform to GCDWR standards.
2. Approved “as-built” Drawings are required prior to final payment.

B. “As-Built” Record Drawings:

1. Contractor shall submit to the Clayton County Water Resources two (2) sets of Certified Record Documents of the detention/BMP facilities prepared by a land surveyor currently registered in the State of Georgia and an “as-built” Hydrology Study prepared from the record detention survey and shall be prepared by an Engineer currently registered in Georgia. The following information shall be included in all detention/BMP Basin Record Documents:
   a. All contours and elevations with an area by depth chart.
   b. Bottom of basin elevation in front of outlet device and opposite end of basin to verify positive drainage.

c. Top of wall or dam elevation to verify freeboard.
d. Width of dam (if applicable) at top of dam.
e. Maximum ponding elevation and limits of ponding.
f. Location of pond in respect to property lines, road right-of-ways(s) and other easements.
g. Detail of outlet device showing all elevations and dimensions.
h. Date of record survey.
i. Registered land Surveyor's seal.

2. "As-Built" Hydrological Study shall contain:
   a. Allowable release rates as indicated in the original design for all storms.
   b. Design volumes as indicated in the original design for all storms.
   c. Calculations showing the actual 1, 2, 5, 10, 25, 50 and 100-year release rates, ponding elevations and volumes.
   d. Detail of outlet device showing all elevations and dimensions.
   e. Drainage map.
   f. Date of study.
   g. Professional Engineer's seal.

END OF SECTION 33 40 00