CONTRACT DOCUMENTS FOR:

ITB # 022-16
RENOVATION OF FREDERICK DOUGLASS RECREATION CENTER

PROJECT #PR1206

March 2016

MAYOR: CRAIG CATES

COMMISSIONERS:

RICHARD PAYNE

BILLY WARDLOW

JIMMY WEEKLEY

CLAYTON LOPEZ

SAM KAUFFMAN

MARGARET RAMERO

PREPARED BY:
Hayes Cumming Architects

COPY NO._____

CITY OF KEY WEST

KEY WEST, FLORIDA

CONTRACT DOCUMENTS

FOR

RENOVATION OF FREDERICK DOUGLASS GYM

****

CONSISTING OF:
BID REQUIREMENTS
CONTRACT FORMS
CONDITIONS OF THE CONTRACT
SCOPE OF WORK
SPECIFICATIONS
DRAWINGS

****

KEY WEST, FLORIDA

MARCH 2016

Project No. PR1206 Copy No._____

Table of Contents

Page No.

PART 1 - BIDDING REQUIREMENTS

PART 2 - CONTRACT

PART 3 - CONDITIONS OF THE CONTRACT

PART 4 - SCOPE OF WORK

PART 5 SPECIFICATIONS AND DRAWINGS

PART 1

BIDDING REQUIREMENTS

INVITATION TO BID

Sealed bids for the City of Key West ITB #022-16 RENOVATION OF FREDERICK DOUGLASS GYM, addressed to the City of Key West, will be received at the Office of the City Clerk, 3126 Flagler St., Key West Florida, 33040 until 4:00pm on April 27, 2016 and then will be publicly opened and read. Any bids received after the time and date specified will not be considered.

Please submit one (1) original, one (1) copy and two (2) flash drives each with one single PDF file of the entire bid package. Bid package is to be enclosed in a sealed envelope, clearly marked on the outside "BID FOR" addressed and delivered to the City Clerk at the address noted above.

The project consists of the selective demolition of the low bay portion of the structure, removal of roof and roof deck of the gymnasium, roof replacement on the existing gymnasium roof sections to remain, construction of a new low bay building in the same location as the demolished structure and selective landscaping and sitework.

Drawings and Specifications may be obtained from Demand Star by Onvia. Please contact Demand Star at www.demandstar.com or call 1-800-711-1712 or ckw@www.cityofkeywest-fl.gov.

A **pre-bid meeting** will be held in the conference room at 3132 Flagler Avenue, Key West, Florida on **Tuesday April 12, 2016 at 1:00pm.**

The successful Bidder will be required to furnish the necessary additional bond(s) for the faithful performance of the Contract, as prescribed in the Bidding Documents. The Bidder will also be required to furnish documentation showing that he is in compliance with the licensing requirements of the State and the provisions of Chapter 66 section 87 of the Code of Ordinances of the City of Key West. Compliance with these provisions is required before the Contractor can enter into the agreement contained in the Contract Documents. Specifically, Bidder shall demonstrate that he holds, as a minimum, the following licenses and certificates required by State Statute and local codes.

EACH BID MUST BE SUBMITTED ON THE PRESCRIBED FORM AND ACCOMPANIED BY BID SECURITY AS PRESCRIBED IN THE INSTRUCTIONS TO BIDDERS, PAYABLE TO THE CITY OF KEY WEST, FLORIDA, IN AN AMOUNT NOT LESS THAN FIVE (5) PERCENT OF THE AMOUNT BID.

THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.

The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of the provisions of Chapter 66 Section 87 of the Code of Ordinances of the City of Key West; within 10 days the following the Notice of Award and must demonstrate that he holds at a minimum, the following licenses & certificates;

A. City of Key West Business Tax License Receipt
B. A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida.

All bid bonds, contract bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or Insurance Company having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of

Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida.

Before a Contract will be awarded for the work contemplated herein, the CITY will conduct such investigation as is necessary to determine the performance record and ability of the apparent low Bidder to perform the size and type of work specified under this Contract. Upon request, the Bidder shall submit such information as deemed necessary by the CITY to evaluate the Bidder's qualifications.

For information concerning the proposed work, or for appointment to visit the site of the proposed work, contact L. Kreed Howell, Project Manager, for Engineering Services Department for the City of Key West at 305 809-3963 or lhowell@cityofkeywest-fl.gov.

As stated above at the time of the bid submittal the Bidder must provide satisfactory documentation of State Licenses. The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of County, and City licenses as would be required within ten days of the award. The successful Bidder must also be able to satisfy the City Attorney as to such insurance coverage and legal requirements as may be demanded by the Bid in question. The City may reject bids for any and/or all of the following reasons: (1) for budgetary reasons, (2) if the bidder misstates or conceals a material fact in its bid, (3) if the bid does not strictly conform to the law or is non-responsive to the bid requirements, (4) if the bid is conditional, or (5) if a change of circumstances occurs making the purpose of the bid unnecessary to the City. The City may also waive any minor formalities or irregularities in any bid, (6) if such rejection is in the best interest of the City. The City may also waive any minor formalities or irregularities in any bid.

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INSTRUCTIONS TO BIDDERS

1. CONTRACT DOCUMENTS

A. FORMAT

The Contract Documents are divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the sections into work performed by the various building trades, work by separate subcontractors, or work required for separate facilities in the project.

B. DOCUMENT INTERPRETATION

The separate sections contained within these Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the proposed work.

Should there be any doubt as to the meaning or intent of said Contract Documents, the Bidder should request of the ARCHITECT, in writing (at least 10 working days prior to bid opening) an interpretation thereof. Any interpretation or change in said Contract Documents will be made only in writing in the form of Addenda to the documents which will be furnished to all registered holders of Contract Documents. Bidders shall submit with their Proposals, or indicate receipt of, all Addenda. The CITY will not be responsible for any other explanation or interpretations of said Documents.

2. GENERAL DESCRIPTION OF THE PROJECT

A general description of the work to be done is contained in the Invitation to Bid. The scope is specified in applicable parts of these Contract Documents.

3. QUALIFICATION OF CONTRACTORS

The prospective Bidders must meet the statutorily prescribed requirements before award of Contract by the CITY. Bidders must hold or obtain all licenses and/or certificates as required by the State and Local Statutes in order to bid and perform the work specified herein.

4. BIDDER'S UNDERSTANDING

Each Bidder must inform himself of the conditions relating to the execution of the work, and it is assumed that he will inspect the site and make himself thoroughly familiar with all the Contract Documents. Failure to do so will not relieve the successful Bidder of his obligation to enter into a Contract and complete the contemplated work in strict accordance with the Contract Documents. It shall be the Bidder's obligation to verify for himself and to his complete satisfaction all information concerning site and subsurface conditions.

The CITY will make available to prospective Bidders upon request and at the office of the ARCHITECT, prior to bid opening, any information that he may have as to subsurface conditions and surface topography at the worksite.

Each Bidder shall inform himself of, and the Bidder awarded a Contract shall comply with, federal, state, and local laws, statutes, and ordinances relative to the execution of the work. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, nondiscrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non-burning requirements, permits, fees, and similar subjects.

5. TYPE OF PROPOSAL

A. LUMP SUM

The Proposal for the work is to be submitted on a lump sum basis. Lump sum prices shall be submitted for all items of work set forth in the Proposal. All items required to complete the work specified but not included in the Proposal shall be considered incidental to those set forth in the Proposal.
The Bidder shall submit a Schedule of Values with the Proposal. It shall be broken down by trade and type of work and it shall be used as a basis for payment. Payment to the Contractor will be made on the percent complete of the work performed by the Contractor as specified in the Contract Documents.

6. PREPARATION OF BIDS

A. GENERAL

All blank spaces in the BID form must be filled in, as required, preferably in BLACK ink. All price information shall be shown in both words and figures where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in case of discrepancy between the amounts stated in writing and the amounts stated in figures.

Any BID shall be deemed informal which contains omissions, erasures, alterations, or additions of any kind, or prices uncalled for, or in which any of the prices are obviously unbalanced, or which in any manner shall fail to conform to the conditions of the published Invitation to Bid.

Only one BID from any individual, firm, partnership, or corporation, under the same or different names, will be considered. Should it appear to the CITY that any Bidder is interested in more than one Proposal for work contemplated; all Proposals in which such Bidder is interested will be rejected.

B. SIGNATURE

The Bidder shall sign his BID in the blank space provided therefore. If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign Contracts on behalf of the corporation. If Bidder is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign Contracts in behalf of the partnership. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a notarized power-of-attorney must be on file

with the CITY prior to opening of Proposals or submitted with the Proposal, otherwise the Proposal will be regarded as not properly authorized.

C. SPECIAL BIDDING REQUIREMENTS

The Bidder's attention is brought to the hiring practices and licenses and permits of the City of Key West. These are defined in the addition to Article 39, ORDINANCES, PERMITS, AND LICENSES, as set forth in the Supplementary Conditions.

The Bidder shall submit with his Bid his experience record showing his experience and expertise in roof construction and related work. Such experience record shall provide at least five current or recent projects of similar work, within the State Florida and preferably Monroe County. For each project the following information shall be provided:

1. Description and location of work.
2. Contract amount.
3. Dates work was performed.
4. Owner.
5. Name of Owner's contact person and phone number.
6. ARCHITECT.
7. Name of ARCHITECT's contact person and phone number.

The bidder shall submit with his bid a list of items to be performed by his own labor and that performed by subcontractors or others.

D. ATTACHMENTS

Bidder shall complete and submit the following forms with his bid:

Anti-Kickback Affidavit
Public Entity Crimes Form
Indemnification Form
Local Vendor Certification
City of Key West Business License Tax Receipt
Domestic Partnership Affidavit
Cone of Silence Affidavit

E. PUBLIC ENTITY CRIMES FORM

Pursuant to the requirements of Chapter 287.133, Laws of Florida, pertaining to the sworn statement on Public Entity Crimes and the Convicted Vendor List, all Bidders shall submit a signed and notarized statement with their Bid on the form provided herein.

7. STATE AND LOCAL SALES AND USE TAXES

Unless the Supplementary Conditions contains a statement that the CITY is exempt from state sales tax on materials incorporated into the work due to the qualification of the work under this Contract, the Contractor, as required by the laws and statutes of the state and its political subdivisions, shall pay all state and local sales and use taxes. Prices quoted in the Proposal shall

THE CITY OF KEY WEST
Post Office Box 1409 Key West, FL 33041-1409 (305) 809-3883

LOCAL VENDOR CERTIFICATION PURSUANT TO CKW ORDINANCE 09-22 SECTION 2-798

The undersigned, as a duly authorized representative of the vendor listed herein, certifies to the best of his/her knowledge and belief, that the vendor meets the definition of a "Local Business." For purposes of this section, "local business" shall mean a business which:

a. Principle address as registered with the FL Department of State located within 30 miles of the boundaries of the city, listed with the chief licensing official as having a business tax receipt with its principle address within 30 miles of the boundaries of the city for at least one year immediately prior to the issuance of the solicitation.

b. Maintains a workforce of at least 50 percent of its employees from the city or within 30 miles of its boundaries.

c. Having paid all current license taxes and any other fees due the city at least 24 hours prior to the publication of the call for bids or request for proposals.

- Not a local vendor pursuant to Ordinance 09-22 Section 2-798
- Qualifies as a local vendor pursuant to Ordinance 09-22 Section 2-798

If you qualify, please complete the following in support of the self-certification & submit copies of your County and City business licenses. Failure to provide the information requested will result in denial of certification as a local business.

Business Name _____ Phone:

Current Local Address: _____ Fax:_____ (P.O Box numbers may not be used to establish status)

Length of time at this address:_____

_____Date: _____
Signature of Authorized Representative

THE CITY OF KEY WEST
Post Office Box 1409 Key West, FL 33041-1409 (305) 809-3883

STATE OF_____ COUNTY OF_____

The foregoing instrument was acknowledged before me this _____day of_____, 2015.

By _____, of _____
(Name of officer or agent, title of officer or agent) (Name of corporation acknowledging)

or has produced identification_____as identification
(Type of identification)

_____
Signature of Notary

_____
Print, Type or Stamp Name of Notary

_____
Title or Rank

Return Completed form with
Supporting documents to: City of
Key West Purchasing

include all nonexempt sales and use taxes, unless provision is made in the Proposal form to separately itemize the tax.

8. SUBMISSION OF BIDS

All BIDS must be submitted not later than the time prescribed, at the place, and in the manner set forth in the Invitation to Bid. BIDS must be made on the BID forms provided herewith, **submit one (1) ORIGINAL and one (1) COPY of bid package and two (2) FLASH DRIVES each containing a single PDF file of the entire bid package.**

Each BID must be submitted in a sealed envelope, so marked as to indicate the Bidder's name and its contents (project name and number) without being opened, and addressed in conformance with the instructions in the Invitation to Bid.

9. MODIFICATION OR WITHDRAWAL OF BIDS

Prior to the time and date designated for receipt of BIDS, any BID submitted may be withdrawn by notice to the party receiving BIDS at the place designated for receipt of BIDS. Such notice shall be in writing over the signature of the Bidder or by telegram. If by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of BID. No BID may be withdrawn after the time scheduled for opening of BIDS, unless the time specified in paragraph AWARD OF CONTRACT of these Instructions to Bidders shall have elapsed.

10. BID SECURITY

BIDS must be accompanied by cash, a certified check, or cashier's check drawn on a bank in good standing, or a bid bond issued by a Surety authorized to issue such bonds in the state where the work is located, in the amount of five (5) percent of the total amount of the Proposal submitted. This bid security shall be given as a guarantee that the Bidder will not withdraw his BID for a period of sixty (60) days after bid opening, and that if awarded the Contract, the successful Bidder will execute the attached Contract and furnish properly executed Performance and Payment Bonds, each in the full amount of the Contract price within the time specified. Agent and Surety phone numbers must be provided.

The Attorney-in-Fact who executes this bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond. Where State Statute requires, certification by a resident agent shall also be provided.

If the Bidder elects to furnish a Bid Bond, he shall use the Bid Bond form bound herewith, or one conforming substantially thereto in form and content.

11. RETURN OF BID SECURITY

Within 15 days after the award of the Contract, the CITY will return the bid securities to all Bidders who’s BIDS are not to be further considered in awarding the Contract. Retained bid securities will be held until the Contract has been finally executed, after which all bid securities, other than Bidders' bonds and any guarantees, which have been forfeited, will be returned to the

respective Bidders whose Proposals they accompanied.

12. AWARD OF CONTRACT

Within sixty (60) calendar days after the opening of Proposals, the CITY will accept one of the Proposals or will act in accordance with the following paragraphs. The acceptance of the Proposal will be by written notice of award, mailed to the office designated in the Proposal, or delivered to the Bidder's representative. In the event of failure of the lowest responsive, responsible Bidder to sign the Contract and provide an acceptable Performance Bond, Payment Bond, insurance certificate(s) and evidence of holding required licenses and certificates, the Owner may award the Contract to the next lowest responsive, responsible Bidder. Such award, if made, will be made within seventy-five (75) days after the opening of Proposals.

The CITY reserves the right to accept or reject any or all Proposals, and to waive any informalities and irregularities in said Proposals.

13. BASIS OF AWARD

The award will be made by the Owner on the basis of the BID (Base + Accepted Alternates) from the lowest, responsive, responsible BIDDER which, in the Owner's sole and absolute judgment will best serve the interest of the Owner.

14. EXECUTION OF CONTRACT

The successful Bidder shall, within ten (10) working days after receiving Notice of Award, sign and deliver to the CITY an original Contract and two (2) copies in the form hereto attached, together with the insurance certificate examples of the bonds as required in the Contract Documents and evidence of holding required licenses and certificates. Within 10 working days after receiving the signed Contract from the successful Bidder, the City's authorized agent will sign the Contract. Signature by both parties constitutes execution of the Contract.

15. CONTRACT BONDS

A. PERFORMANCE AND PAYMENT BONDS

The successful Bidder shall file with the CITY, at the time of delivery of the signed Contract, a Performance Bond and Payment Bond on the form bound herewith, each in the full amount of the Contract price in accordance with the requirements of Florida Statutes Section 255.05 or 713.23, as applicable, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the construction of the work, and to cover all guarantees against defective workmanship or materials, or both, during the warranty period following the date of final acceptance of the work by the CITY. The Surety furnishing this bond shall have a sound financial standing and a record of service satisfactory to the CITY, shall be authorized to do business in the State of Florida, and shall be listed on the current U.S. Department of Treasury Circular Number 570, or amendments thereto in the Federal Register, of acceptable Sureties for federal projects. The CONTRACTOR shall supply the OWNER with phone numbers, addresses, and contacts for the Surety and their agents. Pursuant to Section 255.05(7), Florida Statutes, in lieu of the bond required by law, the contractor may file with the city an alternative form of security in the form of cash, a money order, a certified check, a cashier's check or an irrevocable letter of credit.

B. POWER-OF-ATTORNEY

The Attorney-in-Fact (Resident Agent) who executes this Performance and Payment Bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond.
All Contracts, Performance and Payment Bonds, and respective powers-of-attorney will have the same date.

16. FAILURE TO EXECUTE CONTRACT AND FURNISH BOND

The Bidder who has a Contract awarded to him and who fails to promptly and properly execute the Contract or furnish the required Bonds shall forfeit the bid security that accompanied his bid, and the bid security shall be retained as liquidated damages by the CITY, and it is agreed that this said sum is a fair estimate of the amount of damages the CITY will sustain in case the Bidder fails to enter into a Contract or furnish the required Bonds. Bid security deposited in the form of cash, a certified check, or cashier's check shall be subject to the same requirement as a Bid Bond.

17. PERFORMANCE OF WORK BY CONTRACTOR

Each Bidder must furnish with his Proposal a list of the items that he will perform with his own forces and the estimated total cost of these items.

18. TIME OF COMPLETION

The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions stated in the General Conditions.

When the Contractor receives a Notice to Proceed, he shall commence work as soon as possible and shall complete all work within the number of calendar days stipulated in this Proposal.

The term of this contract will be **305** calendar days.

* * * * * *

NOTE TO BIDDER: Use preferably BLACK ink for completing this Proposal form.

PROPOSAL

To:	The City of Key West
Address:	3126 Flagler Street, Key West, Florida 33041
Project Title:	RENOVATION OF FREDERICK DOUGLASS GYM PR 1206

Bidder's contact person for additional information on this Proposal:

Company Name: _____

Contact Name & Telephone #: _____

Email Address: _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein, that this Proposal is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Proposal is made without any connection or collusion with any person submitting another Proposal on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal.

CONTRACT EXECUTION AND BONDS

The Bidder agrees that if this Proposal is accepted, he will, within 10 days, not including Sundays and legal holidays, after Notice of Award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner examples of the Performance Bond and Payment Bond required herein, and evidence of holding required licenses and certificates, and will, to the extent of his Proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

START OF CONSTRUCTION AND CONTRACT COMPLETION TIME

The Bidder further agrees to begin work within 14 calendar days after the date of the Notice to proceed and to complete the project, in all respects within **305** calendar days after the date of the Notice to Proceed.

LIQUIDATED DAMAGES

In the event the Bidder is awarded the Contract and shall fail to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid to the Owner at the rate of $1,000.00 per day for all work awarded until the work has been satisfactorily completed as provided by the Contract Documents. Sundays and legal holidays shall be excluded in determining days in default.

ADDENDA

The Bidder hereby acknowledges that he has received Addenda No's. _____, _____,
____, _____, ____, ____, _____, _____, _____, _____, _____, _____,
(Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that his Proposal(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all federal, state, and local sales and use taxes are included in the stated bid prices for the work.

LUMP SUM ITEMS

The Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on the following lump sum amounts. The Bidder agrees that the lump sum represent a true measure of the labor and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

Total Lump Sum Bid:

$ _____

_____Dollars & _____Cents
(amount written in words)

PROPOSAL CONTINUES ON NEXT PAGE

ADDITIVE / ALTERNATES

5. 08453 FIBERGLASS SANDWICH PANEL ASSEMBLIES

A. This component was specifically reviewed and approved by the City of Key West Historic Architecture Review Commission (HARC). As such, it is necessary to identify any alternates offered during the bidding process. Once the bid has been awarded, no substitution whatsoever will be allowed for this component and the successful bidder must plan accordingly to include any long lead time requirements. Any alternates offered much comply exactly with the dimensions, performance and appearance of the Guardian 275 system. If there is any doubt about matching exactly, the decision to accept this alternate is at the sole discretion of the ARCHITECT.

1 LS _____$_____

NOTE: THE TOTAL OF BASE BID + ACCEPTED ALTERNATES WILL BE THE BASIS OF EVALUATING LOW BIDDER AND BASIS OF AWARD

Owner has the right to accept any or all or no Additive/Alternate items.

The Bidder shall submit a Schedule of Values with the Proposal. It shall be broken down by trade and type of work and it shall be used as a basis for payment. The Bidder will be considered non-responsive if Schedule of Values not included in Bid package.

Payment for materials and equipment authorized by the ARCHITECT in a written Change Order but not listed in the above Proposal will be provided at the suppliers invoice plus 10 %.

List items to be performed by CONTRACTOR's own forces and the estimated total cost of these items. (Use additional sheets if necessary.)

_____ _____

_____ _____

_____ _____

SUBCONTRACTORS

The Bidder further proposes that the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the work in the event that the Bidder is awarded the Contract:

_____
Name

_____, _____, _____, _____
Street City State Zip

Name

_____, _____, _____ ,_____
Street City State Zip

_____
Name

_____, _____, _____,_____
Street City State Zip

_____
Name

_____, _____, _____,_____
Street City State Zip

SURETY

_____ whose address is

_____, _____, _____, _____
Street City State Zip

BIDDER

The name of the Bidder submitting this Proposal is

_____ doing business at

_____, _____, _____, _____
Street City State Zip

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Proposal, or of the partnership, or of all persons interested in this Proposal as principals are as follows:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this _____ day of _____ 2016.

_____
Signature of Bidder

_____
Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this _____ day of _____ 2016.

(SEAL)

_____
Name of Corporation

By _____

Title _____

Attest_____
Secretary

EXPERIENCE OF BIDDER

The Bidder states that he is an experienced CONTRACTOR and has completed similar projects within the last 5 years.

(List similar projects, with types, names of OWNERs, construction costs, ARCHIECTs, and references with phone numbers. Use additional sheets if necessary.

_____
_____
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_____

****

FLORIDA BID BOND

BOND NO. _____

AMOUNT: $ _____

KNOW ALL MEN BY THESE PRESENTS, that _____

_____

hereinafter called the PRINCIPAL, and _____

_____

a corporation duly organized under the laws of the State of _____

having its principal place of business at _____

_____in the State of _____,
and authorized to do business in the State of Florida, as SURETY, are held and firmly bound unto

_____

hereinafter called the OBLIGEE, in the sum of_____
DOLLARS ($_____) for the payment for which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these present.

THE CONDITION OF THIS BOND IS SUCH THAT:

WHEREAS, the PRINCIPAL is herewith submitting his or its Bid Proposal for the Renovation of the Frederick Douglas Recreation Center, said Bid Proposal, by reference thereto, being hereby made a part hereof.

WHEREAS, the PRINCIPAL contemplates submitting or has submitted a bid to the OBLIGEE for

the furnishing of all labor, materials (except those to be specifically furnished by the CITY), equipment, machinery, tools, apparatus, means of transportation for, and the performance of the work covered in the Proposal and the detailed Specifications, entitled:

RENOVATION OF THE FREDERICK DOUGLAS RECREATION CENTER / PR 1206

WHEREAS, it was a condition precedent to the submission of said bid that a cashier's check, certified check, or bid bond in the amount of 5 percent of the base bid be submitted with said bid as a guarantee that the Bidder would, if awarded the Contract, enter into a written Contract with the CITY for the performance of said Contract, within 10 working days after written notice having been given of the award of the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the PRINCIPAL within 10 consecutive calendar days after written notice of such acceptance, enters into a written Contract with the OBLIGEE and furnishes the Performance and Payment Bonds, each in an amount equal to 100 percent of the base bid, satisfactory to the CITY, then this obligation shall be void; otherwise the sum herein stated shall be due and payable to the OBLIGEE and the Surety herein agrees to pay said sum immediately upon demand of the OBLIGEE in good and lawful money of the United States of America, as liquidated damages for failure thereof of said PRINCIPAL.

Signed and sealed this _____ day of _____, 2016.

PRINCIPAL

By_____

_____
SURETY

By _____
Attorney-In-Fact

STATE OF _____)
: SS
COUNTY OF _____)

ANTI – KICKBACK AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I, the undersigned hereby duly sworn, depose and say that no portion of the sum herein bid will be paid to any employees of the City of Key West as a commission, kickback, reward or gift, directly or indirectly by me or any member of my firm or by an officer of the corporation.

By: _____

Sworn and subscribed before me this _____day of _____, 2016.

NOTARY PUBLIC, State of _____ at Large

My Commission Expires:

* * * * * *

SWORN STATEMENT UNDER SECTION 287.133(3)(A)
FLORIDA STATUTES, ON **PUBLIC ENTITY CRIMES**

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted with Bid or Proposal for _____

   _____

2. This sworn statement is submitted by_____
   (name of entity submitting sworn statement)

   whose business address is _____

   _____

   and (if applicable) its Federal Employer Identification Number (FEIN) is_____

   _____

   (If the entity has no FEIN, include the Social Security Number of the individual

   signing this sworn statement _____

3. My name is _____
   (please print name of individual signing)

   and my relationship to the entity named above is _____

4. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including but not limited to, any bid or contract for goods or services to be provided to any public or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, material misrepresentation.

5. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(1)(b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication guilt, in any federal or state trial court of record relating to charges brought by indictment information after July 1, 1989, as a result of a jury verdict, nonjury trial, or entry of a plea of guilty or nolo contendere.

6. I understand that an "affiliate" as defined in Paragraph 287.133(1)(a), Florida Statutes, means

a. A predecessor or successor of a person convicted of a public entity crime; or

b. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm's length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.

7. I understand that a "person" as defined in Paragraph 287.133(1)(8), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies).

____Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND (Please indicate which additional statement applies.)

_____There has been a proceeding concerning the conviction before a hearing of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)

_____The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of

Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order.)

_____The person or affiliate has not been put on the convicted vendor list. (Please describe any action taken by or pending with the Department of General Services.)

_____
(signature)

_____
(date)

STATE OF_____

COUNTY OF_____

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

_____who, after first being sworn by me, affixed his/her
(name of individual signing)

signature in the space provided above on this_____day of _____ , 2016.

My commission expires:

_____
NOTARY PUBLIC

INDEMNIFICATION

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

CONTRACTOR: _____ SEAL:

_____
Address

_____
Signature

_____
Print Name

_____
Title

DATE: _____

EQUAL BENEFITS FOR DOMESTIC PARTNERS AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I, the undersigned hereby duly sworn, depose and say that the firm of _____ provides benefits to domestic partners of its employees on the same basis as it provides benefits to employees' spouses per City of Key West Ordinance Sec. 2-799.

By: _____

Sworn and subscribed before me this

_____ day of _____, 2016.

_____
NOTARY PUBLIC, State of _____ at Large

My Commission Expires: _____

CONE OF SILENCE AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I the undersigned hereby duly sworn depose and say that all owner(s), partners, officers, directors, employees and agents representing the firm of _____ have read and understand the limitations and procedures regarding communications concerning City of Key West issued competitive solicitations pursuant to City of Key West Ordinance Section 2-773 Cone of Silence (attached).

Sworn and subscribed before me this

_____ Day of _____, 2016.

_____
NOTARY PUBLIC, State of _____ at Large

My Commission Expires: _____

BIDDER'S CHECKLIST

(Note: The purpose of this checklist is to serve as a reminder of major items to be addressed in submitting a bid and is not intended to be all inclusive. It does not alleviate the Bidder from the responsibility of becoming familiar with all aspects of the Contract Documents and proper completion and submission of his bid.)

1.	All Contract Documents thoroughly read and understood.	[ ]
2.	All blank spaces in Proposal filled in, using black ink.	[ ]
3.	Total and unit prices added correctly and attached Schedule of Values	[ ]
4.	Addenda acknowledged.	[ ]
5.	Subcontractors are named as indicated in the Proposal.	[ ]
6.	Experience record included.	[ ]
7.	Proposal signed by authorized officer.	[ ]
8.	Bid Bond completed and executed, including power-of-attorney dated the same date as Bid Bond.	[ ]
9.	Bidder familiar with federal, state, and local laws, ordinances, rules and regulations affecting performance of the work.	[ ]
10.	Bidder, if successful, able to obtain and/or demonstrate possession of required licenses and certificates within (10) ten calendar days after receiving a Notice of Award.	[ ]
11.	BID submitted intact with the volume entitled “Bidding Requirements” and “Contract Forms”, 1 original, 1 copy and 2 flash drives as stated in the invitation to bid.	[ ]
12.	Bid Documents submitted in sealed envelope and addressed and labeled in conformance with the instructions in the Invitation to Bid.	[ ]

PART 2

CONTRACT FORMS

CONTRACT

This Contract, made and entered into this _____ day of _____ 2016,

by and between the City of Key West, hereinafter called the "Owner", and_____

_____

hereinafter called the "Contractor";

WITNESSETH:

The Contractor, in consideration of the sum to be paid him by the Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery, and appurtenances for ITB #006-16 RENOVATION OF THE FREDERICK DOUGLAS RECREATION CENTER / PR 1206, dated the _____ day of_____ 2016, all in full compliance with the Contract Documents referred to herein.

The CONTRACT DOCUMENTS, including the signed copy of the PROPOSAL, CONTRACT FORMS, PERFORMANCE & PAYMENT BONDS, SCOPE OF WORK, DRAWINGS & SPECIFICATIONS.

In consideration of the performance of the work as set forth in these Contract Documents, the Owner agrees to pay to the Contractor the amount bid in the Proposal as adjusted in accordance with the Contract Documents, or as otherwise herein provided, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to complete the work within on three hundred and five (305) days and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said BID.

The Contractor agrees to remedy all defects appearing in the work or developing in the materials furnished and the workmanship performed under this Contract during the warranty period after the date of final acceptance of the work by the Owner, and further agrees to indemnify and save the Owner harmless from any costs encountered in remedying such defects.

It is agreed that the Contract, based upon the BID, shall be fully complete within the stated number of consecutive calendar days from the date the Notice to Proceed is issued.

In the event the Contractor fails to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid at a rate of $1,000.00 per day. Sundays and legal holidays shall be included in determining days in default.

This contract will automatically expire upon completion of the project. Contractors warranty obligations remain in affect.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this

_____ day of _____, A.D., 2016.

CITY OF KEY WEST

By_____

Title_____

CONTRACTOR

By_____

Title_____

* * * *

FLORDIA PERFORMANCE BOND

BOND NO._____

AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that in accordance with Florida Statutes Section

255.05 _____

with offices at _____

hereinafter called the CONTRACTOR (Principal), and

_____

with offices at_____

a corporation duly organized and existing under and by virtue of the laws of the State of Florida, hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto the **CITY OF KEY WEST,** hereinafter called the CITY (Obligee), in the sum of:

_____DOLLARS ($_____), lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:
WHEREAS, the CONTRACTOR has executed and entered into a certain Contract hereto attached, with the CITY, dated _____, 2016, to furnish at his own cost, charges, and expense all the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the Contract Documents as defined therein, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein;

NOW THEREFORE, the conditions of this obligation are such that if the above bounden CONTRACTOR:

1. Shall in all respects comply with the terms and conditions of said Contract and his obligation there under, including the Contract Documents (which include the scope of work and conditions as prepared by the CITY, invitation to bid, instructions to bidders, the CONTRACTOR'S bid as accepted by the above CITY, the bid and contract performance and payment bonds, and all addenda, if any, issued prior to the opening of bids), being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying PRINCIPAL with labor, materials, or supplies, used directly or indirectly by PRINCIPAL in the prosecution of the work provided for in the contract; and

3. Pays CITY all losses, costs, expenses, damages, attorney's fees, including appellate proceedings, injury or loss of whatever kind and however arising including, without limitation, delay damages to which said CITY may be subject by reason of any wrongdoing, misconduct, want of care or skill, negligence, failure of performance, breach, failure to petition within the prescribed time, or default, including patent infringements, on the part of said CONTRACTOR, his agents or employees, in the execution or performance of said Contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this obligation shall be void; otherwise, to remain in full force and effect for the term of said Contract.

AND, the said Surety for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract Documents, or to the work to be performed, or materials to be furnished there under shall affect said obligation of said Surety on this Bond, and the said Surety does hereby waive notice of any such changes, extension of time, alterations, or additions of the terms of the Contract Documents, or to the work.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

IN WITNESS WHEREOF, the above parties bonded together have executed this instrument

this _____ day of _____, 2016, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

CONTRACTOR

By: _____

(SEAL)

ATTEST

SURETY

By: _____

(SEAL)

ATTEST

FLORIDA PAYMENT BOND

BOND NO._____

AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that in accordance with Florida Statutes Section

255.05,_____

with offices at_____
hereinafter called the CONTRACTOR, (Principal), and

_____

with offices at _____

a corporation duly organized and existing under and by virtue of the laws of the State of _____

_____ , hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto CITY OF KEY WEST**,** hereinafter called the City (Obligee), in the sum of:

_____DOLLARS(_____), lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, and the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:

WHEREAS, the CONTRACTOR has executed and entered into a certain Contract for

ITB # 006-16 RENOVATION OF THE FREDERICK DOUGLAS RECREATION CENTER / PR 1206 attached hereto, with

the CITY, dated_____

_____, 2016, to furnish at his own cost, charges, and expense the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the plans, drawings (if any), and specifications prepared by the CITY, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents specifically mentioned herein and relative hereto, is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein.

NOW THEREFORE, the conditions of this obligation are such that if the above bounden CONTRACTOR shall in all respects comply with the terms and conditions of said Contract and his obligation thereunder, including the Contract Documents ,which include Scope of work and conditions prepared by the CITY, invitation to bid, instructions to bidders, the

CONTRACTOR'S bid as accepted by the CITY, the bid and contract and payment bonds, and all addenda, if any, issued prior to the opening of bids), and further that if said CONTRACTOR shall promptly make payments to all persons supplying materials, equipment, and/or labor, used directly or indirectly by said CONTRACTOR or subcontractors in the prosecution of the work for said contract is accordance with Florida Statutes, Section 255.05 or Section 713.23, then this obligation shall be void; otherwise to remain in full force and effect for the term of said contract, including and all guarantee periods as specifically mentioned in said Contract Documents.

AND, the said SURETY for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract or to the work to be performed, or materials to be furnished thereunder, or in the Contract Documents and specifications accompanying the said contract shall affect said obligation of said SURETY on this Bond, and the said SURETY does hereby waive notice of any such changes, extension of time, alternations, or additions of the terms of the Contract, or to the work, to the Contract Documents, or to the specifications.

Claimant shall give written notice to the CONTRACTOR and the SURETY as required by Section 255.05 or Section 713.23, Florida Statutes. Any action instituted against the CONTRACTOR or SURETY under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2) or Section 713.23, Florida Statutes.

IN WITNESS WHEREOF, the above parties bounded together have executed this instrument

this _____ day of _____, 2016, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

CONTRACTOR

By:_____

(SEAL)

ATTEST

SURETY

By:_____

(SEAL)

ATTEST

PART 3

CONDITIONS OF THE CONTRACT

GENERAL CONDITIONS
CONTENTS

Article

GENERAL CONDITIONS
CONTENTS

Article

PAYMENT

****

DEFINITIONS

Whenever in the Contract Documents the following terms are used, the intent and meaning shall be interpreted as follows:

1. AS APPROVED

The words "as approved", unless otherwise qualified, shall be understood to be followed by the words "by the ARCHITECT for conformance with the Contract Document".

2. AS SHOWN, AND AS INDICATED

The words "as shown" and "as Indicated" shall be understood to be followed by the words "on the Drawings".

3. BIDDER

The person or persons, partnership, firm, or corporation submitting a Proposal for the work contemplated.

4. CONTRACT DOCUMENTS

The "Contract Documents" consist of the Bidding Requirements, Contract Forms, Conditions of the Contact, Specifications, Drawings, all modifications thereof incorporated into the Documents before their execution, Change Orders, and all other requirements incorporated by specific reference thereto. These form the Contract.

5. CONTRACTOR

The person or persons, partnership, firm, or corporation who enters into the Contract awarded him by the OWNER.

6. CONTRACT COMPLETION

The "Contract Completion" is the date the OWNER accepts the entire work as being in compliance with the Contract Documents, or formally waives nonconforming work to extent of nonconformity, and issues the final payment in accordance with the requirements set forth in Article, "Final Payment" of these General Conditions.

7. DAYS

Unless otherwise specifically stated, the term "days" will be understood to mean calendar days. Business day or working day means any day other than Saturday, Sunday, or legal holiday.

8. DRAWINGS

The term "Drawings" refers to the official Drawings, Profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the ARCHITECT, which shows the location, character, dimensions, and details of the work to be performed. Drawings may either be bound in the same book as the balance of the Contract Documents, or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

9. ARCHITECT

The person or organization identified as such in the Contract Documents. The Term "ARCHITECT" means ARCHITECT or his authorized representative.

10. NOTICE

The term "notice" or the requirement to notify, as used in the Contract Documents or applicable state or federal statutes, shall signify a written communication delivered in person or by registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to him who gives the notice.

11. OR EQUAL

The term "or equal" shall be understood to indicate that the "equal" Product is equivalent to or better than the Product named in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the Project design requirements will be made by the ARCHITECT. Such equal Products shall not be purchased or installed by the CONTRACTOR without written authorization.

12. OWNER

The person, organization, or public body identified as such in the Contract Documents.

13. PLANS (See Drawings)

14. SPECIFICATIONS

The term "Specifications" refers to those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the work and certain

administrative details applicable thereto. Where standard specifications, such as those of ASTM, AASHTO, etc., have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents. If referenced specifications conflict with specifications contained herein, the requirements contained herein shall prevail.

15. NOTICE TO PROCEED

A written notice given by the OWNER to the CONTRACTOR (with a copy to the ARCHITECT) fixing the date on which the Contract time will commence to run and on which the CONTRACTOR shall start to perform his obligation under the Contract Documents. The Notice to Proceed will be given within 30 days following the execution of the Contract by the OWNER.

16. SUBSTANTIAL COMPLETION

"Substantial Completion" shall be that degree of completion of the Project or a defined portion of the Project, as evidenced by the ARCHITECT's written notice of Substantial Completion, sufficient to Provide the OWNER, at his discretion, the full-time use of the Project or defined portion of the Project for the purposes for which it was intended. "Substantial Completion" of an operating facility shall be that degree of completion that has Provided a minimum of 7 continuous days of successful, trouble-free, operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the ARCHITECT. All equipment contained in the work, plus all other components necessary to enable the OWNER to operate the facility in a manner that was intended, shall be complete on the substantial completion date.

17. WORK

The word "work" within these Contract Documents shall include all material, labor, tools, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good Practice to Provide a complete and satisfactory system or structure. As used herein, "Provide" shall be understood to mean "furnish and install, complete in-place ".

<u>CONTRACT DOCUMENTS</u>

18. INTENT OF CONTRACT DOCUMENTS

The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. The intent of the Documents is to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any work, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning.

Reference to standard specifications, manuals, or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect on the first published date of the Invitation to Bid, except as may be otherwise specifically stated. However, no Provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, or ARCHITECT, or any of their consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ARCHITECT, or any ARCHITECT's consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of Article LIMITATIONS ON ARCHITECT'S RESPONSIBILITIES.

19. DISCREPANCIES AND OMISSIONS

Any discrepancies or omissions found in the Contract Documents shall be reported to the ARCHITECT immediately. The ARCHITECT will clarify discrepancies or omissions, in writing, within a reasonable time.

In resolving inconsistencies among two or more sections of the Contract Documents, Precedence shall be given in the following order:

A. CONTRACT
B. PROPOSAL
C. SUPPLEMENTARY CONDITIONS
D. INVITATION TO BID
E. INSTRUCTIONS TO BIDDERS
F. GENERAL CONDITIONS
G. SPECIFICATIONS
H. DRAWINGS

Addenda shall take Precedence over all sections referenced therein. Figure dimensions on Drawings shall take precedence over scale dimensions. Detailed Drawings shall take precedence over general Drawings.

20. CHANGES IN THE WORK

The OWNER, without notice to the Sureties and without invalidating the Contract, may order changes in the work within the general scope of the Contract by altering, adding to, or deducting from the work, the Contract being adjusted accordingly. All such work shall be executed under the conditions of the original Contract, except as specifically adjusted at the time of ordering such change.

In giving instructions, the ARCHITECT may order minor changes in the work not involving extra cost and not inconsistent with the purposes of the Project, but otherwise, except in an emergency endangering life and Property, additions or deductions from the work shall be performed only in pursuance of an approved Change Order from the OWNER, countersigned by the ARCHITECT.

If the work is reduced by alterations, such action shall not constitute a claim for damages based on loss of anticipated Profits.

21. EXAMINATION AND VERIFICATION OF CONTRACT DOCUMENTS

The CONTRACTOR shall thoroughly examine and become familiar with all of the various parts of these Contract Documents and determine the nature and location of the work, the general and local conditions, and all other matters, which can in any way affect the work under this Contract. Failure to make an examination necessary for this determination shall not release the CONTRACTOR from the obligations of this Contract. No verbal agreement or conversation with any officer, agent, or employee of the OWNER or with the ARCHITECT either before or after the execution of this Contract shall affect or modify any of the terms or obligations herein contained.

22. DOCUMENTS TO BE KEPT ON THE JOBSITE

The CONTRACTOR shall keep one copy of the Contract Documents on the job- site, in good order, available to the ARCHITECT and to his representatives.

The CONTRACTOR shall maintain on a daily basis at the jobsite, and make available to the ARCHITECT on request, one current record set of the Drawings which have been accurately marked to indicate all modifications in the completed work that differ from the design information shown on the Drawings. Upon Substantial completion of the work, the CONTRACTOR shall give the ARCHITECT one complete set of these marked up record Drawings.

23. ADDITIONALCONTRACT DOCUMENTS

Copies of Contract Documents or Drawings may be obtained on request from the ARCHITECT and by paying the actual cost of reproducing the Contract Documents or Drawings.

24. OWNERSHIP OF CONTRACT DOCUMENTS

All portions of the Contract Documents, and copies thereof furnished by the ARCHITECT are instruments of service for this Project. They are not to be used on other work and are to be returned to the ARCHITECTon request at the completion of the work. Any reuse of these materials without specific written verification or adaptation by the ARCHITECT will be at the risk of the user and without liability or legal expense to the ARCHITECT. Such user shall hold the ARCHITECT harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adaptation shall entitle the ARCHITECT to further compensation at rates to be agreed upon by the user and the ARCHITECT.

THE ARCHITECT

25. AUTHORITY OF THE ARCHITECT

The ARCHITECT will be the OWNER's representative during the construction period. His authority and responsibility will be limited to the Provisions set forth in these Contract Documents. The ARCHITECT will have the Authority to reject work that does not conform to the Contract Documents. However, neither the ARCHITECT'S authority to act under this Provision, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the ARCHITECT to the CONTRACTOR, any SUBCONTRACTOR, their respective Sureties, any of their agents or employees, or any other person performing any of the work.

26. DUTIES AND RESPONSIBILITIES OF THE ARCHITECT

The ARCHITECT will make visits to the site at intervals appropriate to the various stages of construction to observe the Progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He will not make comprehensive or continuous review or observation to check quality or quantity of the work, and he will not be responsible for construction means, methods, techniques, sequences, or Procedures, or for safety Precautions and Programs in connection with the work. Visits and observations made by the ARCHITECT shall not

relieve the CONTRACTOR of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

The ARCHITECT will make recommendations to the OWNER, in writing, on all claims of the OWNER or the CONTRACTOR arising from interpretation or execution of the Contract Documents. Such recommendations will be of factual and/or technical nature, and will not include the legal interpretation of the Contract Documents. Any necessary legal interpretation of the Contract Document will be made by the OWNER. Such recommendation shall be necessary before the CONTRACTOR can receive additional money under the terms of the Contract. Changes in work ordered by the ARCHITECT shall be made in compliance with Article CHANGES IN THE WORK.

One or more Project representatives may be assigned to observe the work. It is understood that such Project representatives shall have the authority to issue notice of nonconformance and make decisions within the limitations of the authority of the ARCHITECT. The CONTRACTOR shall furnish all reasonable assistance required by the ARCHITECT or Project representatives for Proper observation of the work. The above-mentioned Project representatives shall not relieve the CONTRACTOR of his obligations to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

27. LIMITATIONS ON ARCHITECT'S RESPONSIBILITIES

ARCHITECT will not be responsible for CONTRACTOR's means, methods, techniques, sequences, or Procedures of construction, or the safety Precautions and Programs incident thereto, and ARCHITECT will not be responsible for CONTRACTOR's failure to perform or furnish the work in accordance with the Contract Documents.

ARCHITECT will not be responsible for the acts or omissions of CONTRACTOR or of any SUBCONTRACTOR, any supplier, or of any other person or organization performing or furnishing any of the work.

Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "Proper", or "satisfactory", or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ARCHITECT as to the work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective ARCHITECT any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of this Article.

28. REJECTED WORK

Any defective work or nonconforming materials or equipment that may be discovered at any time prior to expiration of the warranty period shall be removed and replaced by work which shall conform to the Provisions of the Contract Documents. Any material condemned or rejected shall be removed at once from the Project site.

Failure on the part of the ARCHITECT to condemn or reject bad or inferior work or to note nonconforming materials or equipment on CONTRACTOR submittals shall not be construed to imply acceptance of such work. The OWNER shall reserve and retain all of its rights and remedies at law against the CONTRACTOR and its Surety for correction of any and all latent defects discovered after the guarantee period.

29. LINES AND GRADES

Lines and grades shall be established as provided in the supplementary conditions. All stakes, marks, and other reference information shall be carefully preserved by the CONTRACTOR, and in case of their careless or unnecessary destruction or removal by him or his employees, such stakes, marks, and other information shall be replaced at the CONTRACTOR's expense.

30. SUBMITTALS

After checking and verifying all field measurements and after complying with applicable Procedures specified in Division I, GENERAL REQUIREMENTS, CONTRACTOR shall submit to ARCHITECT, in accordance with the schedule for submittals for review, shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment), which shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submittal. All submittals shall be identified as ARCHITECT may require. The data shown shall be complete with respect to quantities, dimensions specified, performance and design criteria, materials, and similar data to enable ARCHITECT to review the information.

CONTRACTOR shall also submit to ARCHITECT for review, with such Promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended.

Before submission of each submittal, CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the work and the Contract Documents.

At the time of each submission, CONTRACTOR shall give ARCHITECT specific written notice of each variation that the submittal may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each shop drawing submitted to ARCHITECT for review and approval of each variation.

ARCHITECT will review submittals with reasonable Promptness, but ARCHITECT'S review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or Procedures of construction (except where a specific means, method, technique, sequence, or Procedure of construction is indicated in or required by the Contract Documents) or to safety Precautions or Programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions. CONTRACTOR shall make corrections required by ARCHITECT, and shall return the required number of corrected copies of shop drawings and submit as required new samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ARCHITECT on Previous submittals.

ARCHITECT's review of submittals shall not relieve CONTRACTOR from the responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ARCHITECT's attention to each such variation at the time of submission and ARCHITECT has given written approval of each such variation by a specific written notation thereof incorporated therein or accompanying the shop drawing or sample approval; nor will any approval by ARCHITECT relieve CONTRACTOR from responsibility for errors or omissions in the shop drawings or from responsibility for having complied with the Provisions herein.

Where a shop drawing or sample is required by the specifications, any related work performed Prior to ARCHITECT's review and approval of the pertinent submission shall be at the sole expense and responsibility of the CONTRACTOR.

31. DETAIL DRAWINGS AND INSTRUCTIONS

The ARCHITECT will furnish, with reasonable Promptness, additional instructions by means of Drawings or otherwise, if, in the ARCHITECT's opinion, such are required for the Proper execution of the work. All such Drawings and instructions will be consistent with the Contract Documents, true developments thereof, and reasonably inferable there from.

<u>THE CONTRACTOR AND HIS EMPLOYEES</u>

32. CONTRACTOR, AN INDEPENDENT AGENT

The CONTRACTOR shall independently perform all work under this Contract and shall not be considered as an agent of the OWNER or of the ARCHITECT, nor shall the CONTRACTOR's SUBCONTRACTORS or employees be subagents of the OWNER or of the ARCHITECT.

32. (a) ASSIGNMENT OF CONTRACT

Assignment of any part or the whole of this Contract shall be subject to review and approval of the City Commission.

33. SUBCONTRACTING

Unless modified in the Supplementary Conditions, within 10 days after the execution of the Contract, the CONTRACTOR shall submit to the ARCHITECT the names of all SUBCONTRACTORS Proposed for the work, including the names of any SUBCONTRACTORS that were submitted with the Proposal. The CONTRACTOR shall not employ any SUBCONTRACTORS to which the OWNER may object to as lacking capability to properly perform work of the type and scope anticipated.

The CONTRACTOR is as fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the Contract Documents shall create any contractual relationship between any SUBCONTRACTOR and the OWNER or ARCHITECT.

34. INSURANCE AND LIABILITY

A. GENERAL

The CONTRACTOR shall provide (from insurance companies acceptable to the OWNER) the insurance coverage designated hereinafter and pay all costs before commencing work under this Contract. The CONTRACTOR shall furnish the OWNER with certificates of insurance specified herein showing the type, amount class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:

"The insurance covered by this certificate shall not be canceled or materially altered, except after 30 days' written notice has been received by the OWNER."

In case of the breach of any Provision of this Article, the OWNER, at his option, may take out and maintain, at the expense of the CONTRACTOR, such insurance as the OWNER may deem Proper and may deduct the cost of such insurance from any monies which may be due or become due the CONTRACTOR under this Contract.

B. CONTRACTOR AND SUBCONTRACTOR INSURANCE

The CONTRACTOR shall not commence work under this Contract until he has obtained all the insurance required hereunder and such insurance has been reviewed by the OWNER, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence work on his subcontract until insurance specified below has been obtained. Review of the insurance by the OWNER shall not relieve or decrease the liability of the CONTRACTOR hereunder.

C. COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

The CONTRACTOR shall maintain during the life of this Contract the statutory amount of Workmen's Compensation Insurance, in addition, Employer's Liability Insurance in an amount as specified in the Supplementary Conditions, for each occurrence, for all of his employees to be engaged in work on the Project under this Contract. In case any such work is subcontracted, the CONTRACTOR shall require the SUBCONTRACTOR to provide similar Workmen's Compensation and Employer's Liability Insurance for all of the SUBCONTRACTOR's employees to be engaged in such work.

D. GENERAL LIABILITY INSURANCE (INCLUDING AUTOMOBILE)

The CONTRACTOR shall maintain during the life of this Contract such general liability, completed operations and Products liability, and automobile liability insurance as will Provide coverage for claims for damages for personal injury, including accidental death, as well as for claims for Property damage, which may arise directly or indirectly from performance of the work under this Contract. The general liability policy shall include contractual liability assumed by the CONTRACTOR under Article **INDEMNITY.** Coverage for Property damage shall be on a "broad form" basis with no exclusions for "X, C & U". The amount of insurance to be provided shall be as specified in the Supplementary Conditions.

In the event any work under this Contract is performed by a SUBCONTRACTOR, the CONTRACTOR shall be responsible for any liability directly or indirectly arising out of the work performed by the SUBCONTRACTOR; to the extent such liability is not covered by the SUBCONTRACTOR's insurance.

The OWNER and ARCHITECT, their officers, agents, and employees shall be named as Additional Insured's on the CONTRACTOR's and any SUBCONTRACTOR's general liability and automobile liability insurance policies for any claims arising out of work performed under this Contract.

E. BUILDERS RISK ALL RISK INSURANCE

Unless otherwise modified in the Supplementary Conditions, the CONTRACTOR shall secure and maintain during the life of this Contract, Builders Risk All Risk Insurance coverage in an amount equal to the full value of the facilities under construction. Such insurance shall include coverage for earthquake, landslide, flood, collapse, loss due to the results of faulty workmanship or design, and all other normally covered risks, and shall provide for losses to be paid to the CONTRACTOR, OWNER, and ARCHITECT as their interests may appear.

The OWNER and ARCHITECT, their officers, agents, and employees shall be named as additional insured's on the CONTRACTOR's and any SUBCONTRACTOR's Builders Risk All Risk insurance policies for any claims arising out of work performed under this Contract.

This insurance shall include a waiver of subrogation as to the ARCHITECT, the OWNER, the CONTRACTOR, and their respective officers, agents, employees and SUBCONTRACTORS.

F. NO PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the Provisions hereof in exercising any

authority granted by the Contract, there will be no personal liability upon any public official.

35. INDEMNITY

To the maximum extent permitted by law, the CONTRACTOR shall indemnify and defend the OWNER and the ARCHITECT, and their officers, employees, agents, and sub-consultants, from all claims and losses, including attorney's fees and litigation costs arising out of Property losses or health, safety, personal injury, or death claims by the CONTRACTOR, its SUBCONTRACTORS of any tier, and their employees, agents, or invitees regardless of the fault, breach of Contract, or negligence of the OWNER or ARCHITECT, excepting only such claims or losses that have been adjudicated to have been caused solely by the negligence of the OWNER or the ARCHITECT and regardless of whether or not the CONTRACTOR is or can be named a party in a litigation.

36. EXCLUSION OF CONTRACTOR CLAIMS

In performing its obligations, the ARCHITECT and its consultants may cause expense for the CONTRACTOR or its SUBCONTRACTORS and equipment or material suppliers. However, those parties and their sureties shall maintain no direct action against the ARCHITECT, its officers, employees, agents, and consultants for any claim arising out of, in connection with, or resulting from the engineering services performed or required to be performed.

37. TAXES AND CHARGES

The CONTRACTOR shall withhold and pay any and all sales and use taxes and all withholding taxes, whether State or Federal, and pay all Social Security charges and also all State Unemployment Compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

38. REQUIREMENTS OF STATE LAW FOR PUBLIC WORKS PROJECTS

When the Contract Documents concern public works of the state or any county, municipality, or political subdivision created by its laws, the applicable statutes shall apply. All parties to this Contract shall determine the contents of all applicable statutes and comply with their Provisions throughout the performance of the Contract.

39. CODES, ORDINANCES, PERMITS AND LICENSES

The CONTRACTOR shall keep himself fully informed of all local codes and ordinances, as well as state and federal laws, which in any manner affect the work herein specified. The CONTRACTOR shall at all times comply with said codes and ordinances, laws, and regulations, and Protect and indemnify the OWNER, the ARCHITECT and their respective employees, and its officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses and inspection fees necessary for Prosecution and completion of the work shall be secured and paid for by the CONTRACTOR, unless otherwise specified.

40. SUPERINTENDENCE

The CONTRACTOR shall keep at the project site, competent supervisory personnel. The CONTRACTOR shall designate, in writing, before starting work, a Project superintendent who shall be an employee of the CONTRACTOR and shall have complete authority to represent and to act for the CONTRACTOR. ARCHITECT shall be notified in writing prior to any change in superintendent assignment. The CONTRACTOR shall give efficient supervision to the work, using his best skill and attention. The CONTRACTOR shall be solely responsible for all construction means, methods, techniques, and Procedures, and for providing adequate safety Precautions and coordinating all portions of the work under the Contract. It is specifically understood and agreed that the ARCHITECT, its employees and agents, shall not have control or charge of and shall not be responsible for the construction means, methods, techniques, Procedures, or for providing adequate safety Precautions in connection with the work under Contract.

41. RECEPTION OF ARCHITECT'S COMMUNICATIONS

The superintendent shall receive for the CONTRACTOR all communications from the ARCHITECT. Communications of major importance will be confirmed in writing upon request from the CONTRACTOR.

The ARCHITECT may schedule Project meetings for the purposes of discussing and resolving matters concerning the various elements of the work. Time and place for these meetings and the names of persons required to be Present shall be as determined by the ARCHITECT. CONTRACTOR shall comply with these attendance requirements and shall also require his SUBCONTRACTORS to comply.

42. SAFETY

The CONTRACTOR shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees) and Property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety Provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. The CONTRACTOR's failure to thoroughly familiarize himself with the aforementioned safety Provisions shall not relieve him from compliance with the obligations and penalties set forth therein.

The CONTRACTOR shall develop and maintain for the duration of this Contract, a safety Program that will effectively incorporate and implement all required safety Provisions. The CONTRACTOR shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the safety Program. The duty of the ARCHITECT to conduct construction review of the work does not include review or approval of the adequacy of the CONTRACTOR's safety Program, safety supervisor, or any safety measures taken in, on, or near the construction site. The CONTRACTOR, as a part of his safety Program, shall maintain at his office or other well-known place at the jobsite, safety equipment applicable to the work as Prescribed by the aforementioned authorities, all articles necessary for giving first-aid to the injured, and shall establish the Procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the jobsite.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the ARCHITECT and the OWNER. In addition, the CONTRACTOR must promptly report in writing to the ARCHITECT all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses.

If a claim is made by anyone against the CONTRACTOR or any SUBCONTRACTOR on account of any accident, the CONTRACTOR shall promptly report the facts in writing to the ARCHITECT, giving full details of the claim.

43. PROTECTION OF WORK AND PROPERTY

The CONTRACTOR shall at all times safely guard and Protect from damage the OWNER's Property, adjacent Property, and his own work from injury or loss in connection with this Contract. All facilities required for Protection by federal, state, or municipal laws and regulations and local conditions must be provided and maintained.

The CONTRACTOR shall Protect his work and materials from damage due to the nature of the work, the elements, carelessness of other CONTRACTORs, or from any cause whatever until the completion and acceptance of the work. All loss or damages arising out of the nature of the work to be done under these Contract Documents, or from any unforeseen obstruction or defects which may be encountered in the Prosecution of the work, or from the action of the elements, shall be sustained by the CONTRACTOR.

44. RESPONSIBILITY OF CONTRACTOR TO ACT IN AN EMERGENCY

In case of an emergency which threatens loss or injury of Property, and/or safety of life, the CONTRACTOR shall act, without previous instructions from the OWNER or ARCHITECT, as the situation may warrant. The CONTRACTOR shall notify the ARCHITECT thereof immediately thereafter. Any claim for compensation by the CONTRACTOR, together with substantiating documents in regard to expense, shall be submitted to the OWNER through the ARCHITECT and the amount of compensation shall be determined by agreement.

45. MATERIALS AND APPLIANCES

Unless otherwise stipulated, the CONTRACTOR shall Provide and pay for all materials, labor, water, tools, equipment, heat, light, fuel, power, transportation, construction equipment and machinery, appliances, telephone, sanitary facilities, temporary facilities and other facilities and incidentals necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

In selecting and/or approving equipment for installation in the Project, the OWNER and ARCHITECT assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable federal, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

46. CONTRACTORS' AND MANUFACTURERS' COMPLIANCE WITH STATE SAFETY, OSHA, AND OTHER CODE REQUIREMENTS

The completed work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary

safety items required by the state and federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the work subject to such safety regulations shall be fabricated, furnished, and installed (including OWNER-furnished equipment) in compliance with these requirements. CONTRACTORs and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. CONTRACTORs shall notify all equipment suppliers and SUBCONTRACTORS of the Provisions of this Article.

47. SUBSTITUTION OF MATERIALS

Except for OWNER-selected equipment items, and items where no substitution is clearly specified, whenever any material, article, device, Product, fixture, form, type of construction, or Process is indicated or specified by patent or Proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or Process desired. This Procedure
is not to be construed as eliminating from competition other Products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or equal". The CONTRACTOR may, in such cases, submit complete data to the ARCHITECT for consideration of another material, type, or Process that shall be substantially equal in every respect to that so indicated or specified. Substitute materials shall not be used unless approved in writing. The ARCHITECT will be the sole judge of the substituted article or material.

48. TESTS, SAMPLES, AND OBSERVATIONS

The CONTRACTOR shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the ARCHITECT. When required, the CONTRACTOR shall furnish certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory.

The OWNER, ARCHITECT, and authorized government agents, and their representatives shall at all times be Provided safe access to the work wherever it is in Preparation or Progress, and the CONTRACTOR shall Provide facilities for such access and for observations, including maintenance of temporary and permanent access.

If the Specifications, laws, ordinances, or any public authority require any work, to be specially tested or approved, the CONTRACTOR shall give timely notice of its readiness for observations. If any work should be covered up without approval or consent of the ARCHITECT, it shall, if required by the ARCHITECT, be uncovered for examination at the CONTRACTOR's expense.
Reexamination of questioned work may be ordered by the ARCHITECT, and, if so ordered, the work shall be uncovered by the CONTRACTOR. If such work is found to be in accordance with the Contract Documents, the OWNER will pay the cost of uncovering, exposure, observation, inspection, testing and reconstruction. If such work is found to be not in accordance with the Contract Documents, the CONTRACTOR shall correct the defective work, and the cost of reexamination and correction of the defective work shall be paid by the CONTRACTOR.

49. ROYALTIES AND PATENTS

The CONTRACTOR shall pay all royalty and licenses fees, unless otherwise specified. The CONTRACTOR shall defend all suits or claims for infringement of any patent rights and shall save the OWNER and the ARCHITECT harmless from any and all loss, including reasonable attorneys' fees, on account thereof.

50. CONTRACTOR'S RIGHT TO TERMINATE CONTRACT

If the work should be stopped under an order of any court or other public authority for a period of more than 3 months, through no act or fault of the CONTRACTOR, its SUBCONTRACTORS, or respective employees or if the ARCHITECT should fail to make recommendation for payment to the OWNER or return payment request to CONTRACTOR for revision within 30 days after it is due, or if the OWNER should fail to pay the CONTRACTOR within 30 days after time specified in Article PARTIAL PAYMENTS, any sum recommended by the ARCHITECT, then the CONTRACTOR may, upon 15 days' written notice to the OWNER and the ARCHITECT, stop work or terminate this Contract and recover from the OWNER payment for all acceptable work performed and reasonable termination expenses, unless said default has been remedied.

51. CORRECTION OF DEFECTIVE WORK DURING WARRANTY PERIOD

The CONTRACTOR hereby agrees to make, at his own expense, all repairs or replacements necessitated by defects in materials or workmanship, Provided under terms of this Contract, and pay for any damage to other works resulting from such defects, which become evident within 2 years after the date of final acceptance of the work or within 2 years after the date of substantial completion established by the

ARCHITECT for specified items of equipment, or within such longer period as may be Prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. Un-remedied defects identified for correction during the warranty period but remaining after its expiration shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the work to an extended warranty period of 2 years after the defect has been remedied.

The CONTRACTOR further assumes responsibility for a similar guarantee for all work and materials provided by SUBCONTRACTORS or manufacturers of packaged equipment components. The effective date for the start of the guarantee or warranty period for equipment qualifying as substantially complete is defined in Article SUBSTANTIAL COMPLETION, AND Article SUBSTANTIAL COMPLETION DATE, in these General Conditions.

The CONTRACTOR also agrees to hold the OWNER and the ARCHITECT harmless from liability of any kind arising from damage due to said defects. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order for same from the OWNER. If the CONTRACTOR fails to make the repairs and replacements promptly, or in an emergency where delay would cause serious risk, or loss, or damage, the OWNER may have the defective work corrected or the rejected work removed and replaced, and the CONTRACTOR and his Surety shall be liable for the cost thereof.

PROGRESS OF THE WORK

52. BEGINNING OF THE WORK

Following execution of the Contract, the CONTRACTOR shall meet with the OWNER and ARCHITECT relative to his arrangements for prosecuting the work.

53. SCHEDULES AND PROGRESS REPORTS

Prior to starting the construction, the CONTRACTOR shall Prepare and submit to the ARCHITECT, a Progress schedule showing the dates on which each part or division of the work is expected to be started and finished, and a Preliminary schedule for submittals. The Progress schedule for submittals shall be brought up to date and submitted to the ARCHITECT at the end of each month or at such other times the ARCHITECT may request.

The CONTRACTOR shall forward to the ARCHITECT, at the end of each month, an itemized report of the delivery status of major and critical items of purchased equipment and material, including shop drawings and the status of shop and field fabricated work. These Progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery, and cause of delay, if any.

If the completion of any part of the work or the delivery of materials is behind the submitted Progress schedule, the CONTRACTOR shall submit in writing a plan acceptable to the OWNER and ARCHITECT for bringing the work up to schedule.

The OWNER shall have the right to withhold Progress payments for the work if the CONTRACTOR fails to update and submit the Progress schedule and reports as specified.

54. PROSECUTION OF THE WORK

It is expressly understood and agreed that the time of beginning, rate of Progress, and time of completion of the work are the essence of this Contract. The work shall be prosecuted at such time, and in or on such part or parts of the Project as may be required, to complete the Project as contemplated in the Contract Documents and the Progress schedule.

If the CONTRACTOR desires to carry on work at night or outside the regular hours, he shall give timely notice to the ARCHITECT to allow satisfactory arrangements to be made for observing the work in Progress.

55. OWNER'S RIGHT TO RETAIN IMPERFECT WORK

If any part or portion of the work completed under this Contract shall Prove defective and not in accordance with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, the OWNER shall have the right and authority to retain such work but will make such deductions in the final payment therefore as may be just and reasonable.

56. OWNER'S RIGHT TO DO WORK

Should the CONTRACTOR neglect to Prosecute the work in conformance with the Contract Documents or neglect or refuse at his own cost to remove and replace work rejected by the ARCHITECT, then the OWNER may notify the Surety of the condition, and after 10 days' written notice to the CONTRACTOR and the Surety, or without notice if an emergency or danger to the work or public exists, and without Prejudice to any other right which the OWNER may have under Contract, or otherwise, take over that portion of the

work which has been improperly or non timely executed, and make good the deficiencies and deduct the cost thereof from the payments then or thereafter due the CONTRACTOR.

57. OWNER'S RIGHT TO TRANSFER EMPLOYMENT

If the CONTRACTOR should abandon the work or if he should persistently or repeatedly refuse or should fail to make prompt payment to SUBCONTRACTORS for material or labor, or to persistently disregard laws, ordinances, or to prosecute the work in conformance with the Contract Documents, or otherwise be guilty of a substantial violation of any Provision of the Contract or any laws or ordinance, then the OWNER may, without Prejudice to any other right or remedy, and after giving the CONTRACTOR and Surety 10 days' written notice, transfer the employment for said work from the CONTRACTOR to the Surety. Upon receipt of such notice, such Surety shall enter upon the Premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the work included under this contract and employ by Contract or otherwise, any qualified person or persons to finish the work and Provide the materials therefore, in accordance with the Contract Documents, without termination of the continuing full force and effect of this contract. In case of such transfer of employment to such Surety, the Surety shall be paid in its own name on estimates according to the terms hereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.

If, after the furnishing of said written notice to the Surety, the CONTRACTOR and the Surety still fail to make reasonable Progress on the performance of the work, the OWNER may terminate the employment of the CONTRACTOR and take possession of the Premises and of all materials, tools, and appliances thereon and finish the work by whatever method he may deem expedient and charge the cost thereof to the CONTRACTOR and the Surety. In such case, the CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the expense of completing the Contract, including compensation for additional managerial and administrative services, shall exceed such unpaid balance, the CONTRACTOR and the Surety shall pay the difference to the OWNER.

58. DELAYS AND EXTENSION OF TIME

If the CONTRACTOR is delayed in the Progress of the work by any act or neglect of the OWNER or the ARCHITECT, or by any separate CONTRACTOR employed by the OWNER, or by strikes, lockouts, fire, adverse weather conditions not reasonably anticipated, or acts of Nature, and if the CONTRACTOR, within 48 hours of the start of the occurrence, gives written notice to the OWNER of the cause of the potential delay and estimate of the possible time extension involved, and within 10 days after the cause of the delay has been remedied, the CONTRACTOR gives written notice to the OWNER of any actual time extension requested as a result of the aforementioned occurrence, then the Contract time may be extended by change order for such reasonable time as the ARCHITECT determines. It is agreed that no claim shall be made or allowed for any damages, loss, or expense which may arise out of any delay caused by the above referenced acts or occurrences other than claims for the appropriate extension of time. No extension of time will be granted to the CONTRACTOR for delays occurring to parts of the work that have no measurable impact on the completion of the total work under this Contract. No extension of time will be considered for weather conditions reasonably anticipated for the area in which the work is being performed. Reasonably anticipated weather conditions will be based on official records of monthly Precipitation and other historical data. Adverse weather conditions, if determined to be of a severity that would impact Progress of the work, may be considered as cause for an extension of Contract completion time.

Delays in delivery of equipment or material purchased by the CONTRACTOR or his SUBCONTRACTORS, including OWNER-selected equipment shall not be considered as a just cause for delay, unless the OWNER determines that for good cause the delay is beyond the control of the CONTRACTOR. The CONTRACTOR shall be fully responsible for the timely ordering, scheduling, complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs, which may be accrued by the OWNER after the expiration of the time of completion. It is expressly under- stood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the CONTRACTOR or Surety.

59. DIFFERING SITE CONDITIONS

The CONTRACTOR shall promptly, and before the conditions are disturbed, give a written notice to the OWNER and ARCHITECT of:

A. subsurface or latent physical conditions at the site which differ materially from those indicated in this contract,

B. unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as

inherent in work of the character provided for in the Contract.

The ARCHITECT will investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or the time required for, performing any part of the work under this Contract, whether or not changed as a result of the conditions, and equitable adjustment shall be made under this Article and the Contract modified in writing accordingly.

No request by the CONTRACTOR for an equitable adjustment to the Contract under this Article will be allowed, unless the CONTRACTOR has given the written notice required; Provided that the time prescribed above for giving written notice may be extended by the OWNER.

No request by the CONTRACTOR for an equitable adjustment to the Contract for differing site conditions will be allowed if made after final payment under this Contract.

60. LIQUIDATED DAMAGES

Should the CONTRACTOR fail to complete the work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as Provided in the Contract, the CONTRACTOR shall reimburse the OWNER for the additional expense and damage for each calendar day, Sundays and legal holidays included, that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the OWNER after the expiration of the time of completion. It is expressly under- stood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the CONTRACTOR or Surety.

61. OTHER CONTRACTS

The OWNER reserves the right to let other Contracts in connection with the work. The CONTRACTOR shall afford other CONTRACTORs reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

If any part of the work under this Contract depends for Proper execution or results upon the work of any other CONTRACTOR, utility service company or OWNER, the CONTRACTOR shall inspect and Promptly report to the ARCHITECT in writing any patent or apparent defects to deficiencies in such work that render it unsuitable for such Proper execution and results. The CONTRACTOR's failure to so report shall constitute and acceptance of the work by others as being fit and Proper for integration with work under this Contract, except for latent or non apparent defects and deficiencies in the work.

62. USE OF PREMISES

The CONTRACTOR shall confine his equipment, the storage of materials and the operation of his workers to limits shown on the Drawings or indicated by law, ordinances, permits, or directions of the ARCHITECT, and shall not unreasonably encumber the Premises with his materials. The CONTRACTOR shall provide, at his own expense, the necessary rights-of-way and access to the work, which may be required outside the limits of the OWNER's Property and shall furnish the ARCHITECT copies of permits and agreements for use of the Property outside that provided by the OWNER.

The CONTRACTOR shall not load nor permit any part of the 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.

63. SUBSTANTIAL COMPLETION DATE

The ARCHITECT may issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees, and to establish the date that the OWNER will assume the responsibility for the cost of operating such equipment. Said notice shall not be considered as final acceptance of any portion of the work or relieve the CONTRACTOR from completing the remaining work within the specified time and in full compliance with the Contract Documents. See SUBSTANTIAL COMPLETION under DEFINITIONS of these General Conditions.

64. PERFORMANCE TESTING

Operating equipment and systems shall be performance tested in the Presence of the ARCHITECT to demonstrate compliance with the specified requirements. Performance testing shall be conducted under the specified design operating conditions or under such simulated operating conditions as recommended or approved by the ARCHITECT. Schedule such testing with the ARCHITECT at least one week in

advance of the planned date for testing.

65. OWNER'S USE OF PORTIONS OF THE WORK

Following issuance of the written notice of Substantial Completion, the OWNER may initiate operation of the facility. Such use shall not be considered as final acceptance of any portion of the work, nor shall such use be considered as cause for an extension of the Contract completion time, unless authorized by a Change Order issued by the OWNER.

66. CUTTING AND PATCHING

The CONTRACTOR shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together Properly and fit it to receive or be received by work of other CONTRACTORs shown upon or reasonably implied by the Drawings.

67. CLEANING UP

The CONTRACTOR shall, at all times, keep Property on which work is in Progress and the adjacent Property free from accumulations of waste material or rubbish caused by employees or by the work. Upon completion of the construction, the CONTRACTOR shall remove all temporary structures, rubbish, and waste materials resulting from his operations.

PAYMENT

68. PAYMENT FOR CHANGE ORDERS

The OWNER's request for quotations on alterations to the work shall not be considered authorization to proceed with the work expediting, delivery, and installation of all equipment and materials. Within a reasonable period after the CONTRACTOR submits to the OWNER a written request for an extension of time, the ARCHITECT will Present his written opinion to the OWNER as to whether an extension of time is justified, and, if so, his recommendation as to the number of days for time extension. The OWNER will make the final decision on all requests for extension of time.

Prior to the issuance of a formal Change Order, nor shall such request justify any delay in existing work. Quotations for alterations to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and profit. OWNER may require detailed cost data in order to substantiate the reasonableness of the proposed costs.

Any compensation paid in conjunction with the terms of a Change Order shall comprise total compensation due the CONTRACTOR for the work or alteration defined in the Change Order. By signing the Change Order, the CONTRACTOR acknowledges that the stipulated compensation includes payment for the work or alteration plus all payment for the interruption of schedules, extended overhead, delay, or any other impact claim or ripple effect, and by such signing specifically waives any reservation or claim for additional compensation in respect to the subject Change Order.

At the OWNER's option, payment or credit for any alterations covered by a Change Order shall be determined by one or a combination of the methods set forth in A, B, or C below, as applicable:

A. UNIT PRICES

Those unit Prices stipulated in the Proposal shall be utilized where they are applicable. In the event the Change Order results in a change in the original quantity that is materially and significantly different from the original bid quantity, a new unit Price shall be negotiated upon demand of either party. Unit Prices for new items included in the Change Order shall be negotiated and mutually agreed upon.

B. LUMP SUM

A total lump sum for the work negotiated and mutually acceptable to the CONTRACTOR and the OWNER. Lump sum quotations for modifications to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and Profit, all calculated as specified under "C" below.

C. COST REIMBURSEMENT WORK

The term "cost reimbursement" shall be understood to mean that payment for the work will be made on a time and expense basis, that is, on an accounting of the CONTRACTOR's forces, materials, equipment, and other items of cost as required and used to do the work.

If the method of payment cannot be agreed upon Prior to the beginning of the work, and the OWNER directs by written Change Order that the work be done on a cost reimbursement basis, then the CONTRACTOR shall furnish labor, and furnish and install equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual cost of the following:

1. Labor including foremen for those hours they are assigned and participating in the cost reimbursement work (actual payroll cost, including wages, fringe benefits as established by negotiated labor agreements, labor insurance, and labor taxes as established by law). No other fixed labor burdens will be considered, unless approved in writing by the OWNER.
2. Material delivered and used on the designated work, including sales tax, if paid by the CONTRACTOR or his SUBCONTRACTOR.
3. Rental or equivalent rental cost of equipment, including necessary transportation for items having a value in excess of $100. Rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances shall not exceed the current rental rates prevailing in the locality. The rentals allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items, unless specific agreement to that effect is made.
4. Additional bond, as required and approved by the OWNER.
5. Additional insurance (other than labor insurance) as required and approved by the OWNER.

In addition to items 1 through 5 above, an added fixed fee for general overhead and Profit shall be negotiated and allowed for the CONTRACTOR (or approved SUBCONTRACTOR) actually executing the Cost Reimbursement work.

An additional fixed fee shall be negotiated and allowed the CONTRACTOR for the administrative handling of portions of the work that are executed by an approved SUBCONTRACTOR. No additional fixed fee will be allowed for the administrative handling of work executed by a SUBCONTRACTOR of a SUBCONTRACTOR, unless by written permission from the OWNER.

The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, Profit, and any other general expense. The CONTRACTOR's records shall make clear distinction between the direct costs of work paid for on a cost reimbursement basis and the costs of other work. The CONTRACTOR shall furnish the ARCHITECT report sheets in duplicate of each day's cost reimbursement work no later than the working day following the performance of said work. The daily report sheets shall itemize the materials used, and shall cover the direct cost of labor and the charges for equipment rental, whether furnished by the CONTRACTOR, SUBCONTRACTOR or other forces. The daily report sheets shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated.

Material charges shall be substantiated by valid copies of vendors' invoices. Such invoices shall be submitted with the daily report sheets, or, if not available, they shall be submitted with subsequent daily report sheets. Said daily report sheets shall be signed by the CONTRACTOR or his authorized agent.

The OWNER reserves the right to furnish such materials and equipment as he deems expedient and the CONTRACTOR shall have no claim for profit or added fees on the cost of such materials and equipment. To receive partial payments and final payment for cost reimbursement work, the CONTRACTOR shall submit to the ARCHITECT, detailed and complete documented verification of the CONTRACTOR's and any of his SUBCONTRACTORS' actual costs involved in the cost reimbursement work. Such costs shall be submitted within 30 days after said work has been performed.

69. PARTIAL PAYMENTS

A. GENERAL

Nothing in this Article shall be construed to affect the right, hereby reserved, to reject the whole or any part of the aforesaid work, should such work be later found not to comply with the Provisions of the Contract Documents. All estimated quantities of work for which partial payments have been made are subject to review and correction on the final estimate. Payment by the OWNER and acceptance by the CONTRACTOR of partial payments based on periodic estimates of quantities of work performed shall not, in any way, constitute acceptance of the estimated quantities used as a basis for computing the amounts of the partial payments.

B. ESTIMATE

At least 30 days before each Progress payment falls due, as specified in the Supplementary Conditions, the CONTRACTOR shall submit to the ARCHITECT a detailed estimate of the amount earned during the Preceding month for the separate portions of the work, and request payment. As used in this Article, the words "amount earned" means the value, on the date of the estimate for partial payment, of the work completed in accordance with the Contract Documents, and the value of approved materials delivered to the Project site suitable stored and Protected Prior to incorporation into the work.

ARCHITECT will, within 7 days after receipt of each request for payment, either indicate in writing a recommendation of payment and present the request to OWNER, or return the request to CONTRACTOR indicating in writing ARCHITECT's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may, within 7 days, make the necessary corrections and resubmit the request.

ARCHITECT may refuse to recommend the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to OWNER. ARCHITECT may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such an extent as may be necessary in ARCHITECT's opinion to protect the OWNER from loss because:

1. The work is defective, or completed work has been damaged requiring correction or replacement;

2. Written claims have been made against OWNER or Liens have been filed in connection with the work;

3. The Contract Price has been reduced because of Change Orders;

4. OWNER has been required to correct defective work or complete the work in accordance with Article OWNER'S RIGHT TO DO WORK;

5. Of CONTRACTOR's unsatisfactory Prosecution of the work in accordance with the Contract Documents; or

6. CONTRACTOR's failure to make payment to SUBCONTRACTORS or for labor, materials, or equipment.

C. DEDUCTION FROM ESTIMATE

Unless modified in the Supplementary Conditions, deductions from the estimate will be as described below:

1. The OWNER will deduct from the estimate, and retain as part security, 10 percent of the amount earned for work satisfactorily completed. A deduction and retainage of 10 percent will be made on the estimated amount earned for approved items of material delivered to and properly stored at the jobsite but not incorporated into the work. When the work is 50 percent complete, the OWNER may reduce the retainage to 5 percent of the dollar value of all work satisfactorily completed to date provided the CONTRACTOR is making satisfactory progress and there is no specific cause for a greater retainage. The OWNER may reinstate the retainage up to 10 percent if the OWNER determines, at his discretion, that the CONTRACTOR is not making satisfactory progress or where there is other specific cause for such withholding.

D. QUALIFICATION FOR PARTIAL PAYMENT FOR MATERIALS DELIVERED

Unless modified in the Supplementary Conditions, qualification for partial payment for materials delivered but not yet incorporated into the work shall be as described below:

1. Materials, as used herein, shall be considered to be those items which are fabricated and manufactured material and equipment. No consideration shall be given to individual purchases of less than $200 for any one item.

2. To receive partial payment for materials delivered to the site, but not incorporated in the work, it shall be necessary for the CONTRACTOR to include a list of such materials on the Partial Payment Request. At his sole discretion, the ARCHITECT may approve items for which partial payment is to be made. Partial payment shall be based on the CONTRACTOR's actual cost for the materials as evidenced by invoices from the supplier. Proper storage and Protection shall be provided by the CONTRACTOR, and as approved by the ARCHITECT. Final payment shall be made only for materials actually incorporated in the work and, upon acceptance of the work, all materials remaining for which advance payments had been made shall revert to the CONTRACTOR, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the work.

3. 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 at the time of payment free and clear of all liens, claims, security interests, and encumbrances.

4. If requested by the ARCHITECT, the CONTRACTOR shall provide, with subsequent pay requests, invoices receipted by the supplier showing payment in full has been made.

E. PAYMENT

After deducting the retainage and the amount of all previous partial payments made to the CONTRACTOR from the amount earned, the amount due will be made payable to the CONTRACTOR. Recommendations for payment received by the OWNER less than 9 days Prior to the scheduled day for payment will not be Processed or paid until the following month.

70. CLAIMS FOR EXTRA WORK

In any case where the CONTRACTOR deems additional time or compensation will become due him under this Contract for circumstances other than those defined in Article DELAYS AND EXTENSION OF TIME, the CONTRACTOR shall notify the ARCHITECT, in writing, of his intention to make claim for such time or compensation before he begins the work on which he bases the claim, in order that such matters may be settled, if possible, or other appropriate action taken. The notice of claim shall be in duplicate, in writing, and shall state the circumstances and the reasons for the claim, but need not state the amount. If such notification is not given or if the ARCHITECT is not afforded proper facilities by the CONTRACTOR for keeping strict account of actual cost, then the CONTRACTOR hereby agrees to waive the claim for such additional time or compensation. Such notice by the CONTRACTOR, and fact that the ARCHITECT has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim.

No extension of time will be granted to the CONTRACTOR for delays resulting from extra work that have no measurable impact on the completion of the total work under this Contract. Claims for additional time or compensation shall be made in itemized detail and submitted, in writing, to the OWNER and ARCHITECT within 10 days following completion of that portion of the work for which the CONTRACTOR bases his claim. Failure to make the claim for additional compensation in the manner and within the time specified above shall constitute waiver of that claim. In case the claim is found to be just, it shall be allowed and paid for as provided in Article PAYMENT FOR CHANGE ORDERS.

71. RELEASE OF LIENS OR CLAIMS

The CONTRACTOR shall indemnify and hold harmless the OWNER from all claims for labor and materials furnished under this Contract. Prior to the final payment, the CONTRACTOR shall furnish to the OWNER, as part of his final payment request, a certification that all of the CONTRACTOR's obligations on the project have been satisfied and that all monetary claims and indebtedness have been paid. The CONTRACTOR shall furnish complete and legal effective releases or waivers, satisfactory to the OWNER, of all liens arising out of or filed in connection with the work.

72. FINAL PAYMENT

Upon completion of all the work under this Contract, the CONTRACTOR shall notify the ARCHITECT, in writing, that he has completed his part of the Contract and shall request final payment. Upon receipt of such notice the ARCHITECT will inspect and, if acceptable, submit to the OWNER his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the CONTRACTOR. Upon approval of this final estimate by the OWNER and compliance by the CONTRACTOR with Provisions in Article **RELEASE OF LIENS OR CLAIMS,** and other Provisions as may be applicable, the OWNER shall pay to the CONTRACTOR all monies due him under the Provisions of these Contract Documents.

73. NO WAIVER OF RIGHTS

Neither the inspection by the OWNER, through the ARCHITECT or any of his employees, nor any order by the OWNER for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the OWNER or ARCHITECT, nor any extension of time, nor any possession taken by the OWNER or its employees, shall operate as a waiver of any Provision of this Contract, or any power herein reserved to the OWNER, or any right to damages herein Provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regards to latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the OWNER's rights under the warranty.

74. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the CONTRACTOR of the final payment shall release the OWNER and the ARCHITECT, as representatives of the OWNER, from all claims and all liability to the CONTRACTOR for all things done or furnished in connection with the work, and every act of the OWNER and others relating to or arising out of the work except claims Previously made in writing and still unsettled. No payment, however, final or otherwise, shall operate to release the CONTRACTOR or his Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds and warranties, as herein provided.

SUPPLEMENTARY CONDITIONS

The General Conditions are hereby revised as follows:

~~ARTICLE 9 "ENGINEER"~~

~~Delete Article "ENGINEER" in its entirety and substitute the following:~~

~~The person or organization identified as such in the Contract Documents. The Term "ENGINEER" means ARCHITECT or his authorized representative.~~

ARTICLE 34 "INSURANCE & LIABILITY"

Delete Sections A, B, C, and D and replace with the following:

Contractor shall maintain limits no less than those stated below:

CONTRACTOR is to secure, pay for, and file with the City of Key West, prior to commencing any work under the Contract, all certificates for workers' compensation, public liability, and property damage liability insurance, and such other insurance coverages as may be required by specifications and addenda thereto, in at least the following minimum amounts with specification amounts to prevail if greater than minimum amounts indicated. Notwithstanding any other provision of the Contract, the CONTRACTOR shall provide the minimum limits of liability insurance coverage as follows:

Auto Liability	$1,000,000	Combined Single Limit
General Liability	$2,000,000	Aggregate (Per Project)
	$2,000,000	Products Aggregate
	$1,000,000	Any One Occurrence
	$1,000,000	Personal Injury
	$ 300,000	Fire Damage/Legal
Additional Umbrella Liability	$2,000,000	Occurrence / Aggregate

CONTRACTOR shall furnish an original Certificate of Insurance indicating, and such policy providing coverage to, City of Key West named as an additional insured on a PRIMARY and NON CONTRIBUTORY basis utilizing an ISO standard endorsement at least as broad as CG 2010 (11/85) or its equivalent, (combination of CG 20 10 07 04 and CG 20 37 07 04, providing coverage for completed operations, is acceptable) including a waiver of subrogation clause in favor of City of Key West on all policies. CONTRACTOR will maintain the General Liability and Umbrella Liability insurance coverages summarized above with coverage continuing in full force including the additional insured endorsement until at least 3 years beyond completion and delivery of the work contracted herein.

Notwithstanding any other provision of the Contract, the CONTRACTOR shall maintain complete workers' compensation coverage for each and every employee, principal, officer, representative, or agent of the CONTRACTOR who is performing any labor, services, or

material under the Contract. Further, CONTRACTOR shall additionally maintain the following minimum limits of coverage:

Bodily Injury Each Accident	$1,000,000
Bodily Injury by Disease Each Employee	$1,000,000
Bodily Injury by Disease Policy Limit	$1,000,000

If the work is being done on or near a navigable waterway, CONTRACTOR's workers compensation policy shall be endorsed to provide USL&H Act (WC 00 01 06 A) and Jones Act (WC 00 02 01 A) coverage if specified by the City of Key West. CONTRACTOR shall provide the City of Key West with a Certificate of Insurance verifying compliance with the workman's compensation coverage as set forth herein and shall provide as often as required by the City of Key West such certification which shall also show the insurance company, policy number, effective and expiration date, and the limits of workman's compensation coverage under each policy.

CONTRACTOR's insurance policies shall be endorsed to give 30 days written notice to the City of Key West in the event of cancellation or material change, using form CG 02 24, or its equivalent.

Certificates of Insurance submitted to the City of Key West will not be accepted without copies of the endorsements being requested. This includes additional insured endorsements, cancellation/material change notice endorsements, and waivers of subrogation. Copies of USL&H Act and Jones Act endorsements will also be required if necessary. PLEASE ADVISE YOUR INSURANCE AGENT ACCORDINGLY.

CONTRACTOR will comply with any and all safety regulations required by any agency or regulatory body including but not limited to OSHA. CONTRACTOR will notify City of Key West immediately by telephone at (305) 809-3963 any accident or injury to anyone that occurs on the jobsite and is related to any of the work being performed by the CONTRACTOR.

Add the following Article:

G. SURETY AND INSURER QUALIFICATIONS

All bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or insurance company, having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida. If requested, Contractor shall Provide Proof of Florida Licensure for all insurance companies. The City of Key West shall be named as Additional Insured on the insurance certificates.

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include

costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR'S insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or under the CONTRACTOR under workers' compensation acts, disability benefit acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR, or of any third party to whom the CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

ARTICLE 35 "INDEMNITY"

Delete Article "INDEMNITY" in its entirety and substitute the following:

INDEMNITY

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

ARTICLE 37 “TAXES AND CHARGES”

Add the following:

1.10 PROCEDURES FOR THE OWNER DIRECT PURCHASING (ODP) PROGRAM

A. The City may at its option, institute an Owner Direct Purchasing (ODP) Program for the purchase other materials, which have been bid by the Contractor directly, as a cost saving measure directed at reducing the capital costs associated with construction of the Truman Waterfront Park. The Owner has prepared an ODP procedure, subject to the rules of the Florida Department of Revenue and other agencies having jurisdiction, for the use in this Program, which is presented below.

B. Step 1: The City shall prepare a Purchase Requisition with the information received from the Contractor and appropriate Subcontractor and their supplier for material(s) or equipment which will be used in the construction of the Truman Waterfront Park Phase 1A. The minimum amount of the Purchase Requisition shall be five thousand U.S. Dollars ($5,000). The Purchase Requisition shall include, in addition to the payment terms, a description of the material or equipment in the appropriate quantity/quantities, shipping, insurance, and invoice instructions.

C. Step 2: Upon City approval of the Purchase Requisition, it will develop a Purchase Order for the vendor. The City shall forward a copy of said Purchase Order to the vendor with a required copy to the Contractor. The Contractor is responsible for forwarding a copy of the Purchase Order to the subcontractor with instructions for the subcontractor to contact the vendor and inform vendor that the Purchase Order has been processed and forwarded to the Contractor.

Note: The City shall include its Tax Exempt Number on all Purchase Orders issued as part of the Owner Direct Purchase Program.

D. Step 3: The vendor shall ship the material or equipment to the project site or other designated location. The Contractor shall submit the original invoice received from the vendor and subcontractor to the City for approval along with a Conditional Release of Lien from the vendor. The City shall review the Purchase Order invoice with the Contractor to confirm delivery and to confirm material(s) and or supplies are not damaged or missing and that the materials and or supplies match the description of those materials and/or supplies included in the Purchase Order. Upon City’s approval of the invoice, both parties shall sign the Material Equipment Verification and Confirmation Form for payment. If the Purchase Order invoice is rejected, City shall inform the Contractor, who shall inform the subcontractor and vendor.

E. Step 4: Upon City’s, Contractor’s, and subcontractor’s approval of a Purchase Order, City will submit the Purchase Order invoice for payment. Payments made pursuant to any Purchase Order shall be pursuant to the Florida Prompt Payment Act.

F. Step 5: At the end of each calendar month, Contractor will calculate the total sum of Purchase Orders issued by the city pursuant to this Owner Direct Purchase Program for the Truman Waterfront Park Phase 1A Project and submit to the City. City shall review this submittal prepare a deductive change order for the material(s)/ equipment, including the sales tax saved and submit for review and execution.

G. Step 6: Upon completion of the Truman Waterfront Park Phase 1A Project, the City will reconcile any differences between the total amount of all Purchase Orders, issued pursuant to this Program for the Truman Waterfront Park Phase 1A project and the actual amount paid on said Purchase Orders. The net difference will be adjusted in a Change Order provided to the Owner.

1.11 CHANGES TO AN OWNER DIRECT PURCHASE (ODP) PURCHASE ORDER

A. If a change is required to an existing Purchase Order, Contractor shall fill out an Owner Direct Purchase Order Change Request Form. Included in said Change Request Form shall be a description of the reason for the change and the appropriate backup information from the vendor shall be attached. The Contractor shall submit the Request for review by the Owner.

B. Owner, upon receipt and review of a Direct Purchase Order Change Request Form, may issue an amendment to the existing Purchase Order or void the original Purchase Order and issue a new Purchase Order for the increased or decreased amount.

C. Contractor shall reconcile with City all adjustments to any existing Purchase Orders at the end of each calendar month as required pursuant to Step 5 above.

D. Additional Comments regarding changes to Owner Direct Purchase:

a. The sales tax savings realized pursuant to the Owner Direct Purchase Program shall be calculated as actual savings incurred through the ODP Program.
b. Contractor shall prepare a Direct Purchase Order Summary Log, which will provide a list of all Purchase Orders issued pursuant to the ODP Program along with the amounts invoiced and paid to date for each Purchase Order. The Summary Log shall also include the amount of sales tax saved on each Purchase Order and shall indicate the number of changes orders issued for each Purchase Order. Contractor shall be responsible for constant updates to the Summary Log and shall include a copy of the updated log in its Monthly Progress Report.

ARTICLE 39 "CODES, ORDINANCES, PERMITS, AND LICENSES"

Add the following:

A. PERMIT FOR WORK WITHIN LOCAL RIGHTS-OF-WAY

The Contractor shall obtain from the City of Key West the necessary permits for work within the rights-of-way. The Contractor shall abide by all regulations and conditions, including maintenance of traffic.

B. NOISE ORDINANCE

City of Key West has a noise ordinance that allows working hours between 8:00 AM to 7:00 PM, Monday through Friday and 9:00AM to 5:00PM on Saturday. No work should be performed on Sundays or City Holidays, State Holidays and National Holidays. Any construction operations outside these hours and these days will require a variance from the City of Key West Commission.

C. "LICENSES"

THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.

1. Within 10 days of Notice of Award, the successful Bidder must represent that he holds all applicable, county, and City of Key West licenses and permits required to do business as a contractor with respect to the work described in the Contract Documents.

2. Further, the successful Bidder must, within 10 days of Notice of Award, furnish documentation showing that, as a minimum, he has complied with the provisions of Chapter 18 of the Code of Ordinances of the City of Key West in order to enter into the Agreement contained in the Contract Documents.

3. Specifically, within 10 days after Notice of Award, the successful Bidder must demonstrate that he holds, as a minimum, the following licenses and certificates:

   a.) City of Key West Tax License Receipt;
   b.) A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida
   c.) A valid occupational license issued by the City of Key West, Florida.

D. WORK DURING HOLIDAYS

There shall be no work during City Holidays, State Holidays and National Holidays. Any construction operations during these days shall be approved by the City of Key West.

ARTICLE 42 "SAFETY"

Add the following sub article:

OCCUPATIONAL SAFETY AND HEALTH

The Contractor shall observe and comply with all applicable local, state, and federal occupational safety and health regulations during the prosecution of work under this Contract. In addition, full compliance by the Contractor with the U.S. Department of Labor's Occupational Safety and Health Standards, as established in Public Law 91-596, will be required under the terms of this Contract.

ARTICLE 43 "PROTECTION OF WORK AND PROPERTY"

Add the following Article:

HISTORIC PRESERVATION

The Contractor shall comply with Florida's Archives and Historic Act (Florida Statutes, Chapter 267) and the regulations of the local historic preservation board as applicable and protect against the potential loss or destruction of significant historical or archaeological data, sites, and properties in connection with the project.

ARTICLE 57 “OWNERS RIGHT TO TRANSFER EMPLOYMENT”

Add the following Article:

TERMINATION FOR CONVENIENCE AND RIGHT OF SUSPENSION

A. Owner shall have the right to terminate this Contract without cause by written notice of Termination to the Contractor. In the event of such termination for convenience, the Contractor’s recovery against the Owner shall be limited to that portion of the Contract amount earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred. Contractor shall not be entitled to any other or further recovery against the Owner, including, but not limited to, damages or any anticipated profit on portions of the Work not performed.

B. The Owner shall have the right to suspend all or any portions of the Work upon giving the Contractor prior written notice of such suspension. If all or any portion of the Work is so suspended, the Contractor shall be entitled to reasonable costs, expenses and time extension associated with the suspension.

ARTICLE 60 "LIQUIDATED DAMAGES"

Delete Article "LIQUIDATED DAMAGES" in its entirety and substitute the following:

LIQUIDATED DAMAGES

Should the Contractor fail to complete the work or any part thereof in the time agreed upon in the Contract Documents or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day, Sundays and legal holidays included, that project outlined in Contract Documents remains uncompleted after the completion date. Liquidated damages shall be assessed. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per diem rate as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the Owner after the expiration of the time of completion. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty but as liquidated damages, which have accrued against the Contractor. The Owner shall have the right to deduct such damages from any amount due or that may become due the Contractor or the amount of such damages shall be due and collectible from the Contractor or Surety.

ARTICLE 69 "PARTIAL PAYMENTS"

Delete the first paragraph of Article "PARTIAL PAYMENTS" and substitute the following:

No more than once each month the Contractor shall submit to the ARCHITECT a detailed estimate of the amount earned during the preceding month for the separate portions of the work and request payment. As used in this Article the words "amount earned" means the value, on the date of the estimate, for partial payment of the work completed in accordance with the Contract Documents and the value of approved materials delivered to the project site suitably stored and protected prior to incorporation into the work.

ARTICLE 69 "PARTIAL PAYMENTS"

Add the following:

Payment will be made by the Owner to the Contractor within 40 days receipt of the written recommendation of payment from the ARCHITECT.

ARTICLE 69 "PARTIAL PAYMENT"

Delete Subarticle E "PAYMENT" in its entirety and substitute the following:

PAYMENT

After deducting the retainage and the amount of all previous partial payments made to the Contractor from the amount earned the amount due will be made payable to the Contractor. Recommendations for payment received by the Owner less than 40 days prior to the scheduled day for payment will not be processed or paid until the following month.

The OWNER will withhold progress payments until the Contractor has satisfied the above conditions.

ARTICLE 72 "FINAL PAYMENT"

Delete Article "FINAL PAYMENT" in its entirety and substitute the following:

FINAL PAYMENT

Upon completion of the work the Contractor shall notify the ARCHITECT, in writing, that he has completed it and shall request final payment. The Contractor shall be responsible for keeping an accurate and detailed record of his actual construction. Upon completion of construction and before final acceptance and payment the Contractor shall furnish the ARCHITECT as-built drawings of his construction. Upon receipt of a request for final payment and the as-built drawings the ARCHITECT will inspect and, if acceptable, submit to the Owner his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the Contractor. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Article RELEASE OF LIENS OR CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due him under the provisions of these Contract Documents.

ARTICLE 72 "FINAL PAYMENT"

Add the following;

A. **Acceptance and Final Payment.**

Whenever the Contractor has completely performed the work provided for under the Contract and the ARCHITECT has performed a final inspection and made final acceptance and subject to the terms of the ARCHITECT will prepare a final estimate showing the value of the work as soon as the ARCHITECT makes the necessary measurements and computations. The ARCHITECT will correct all prior estimates and payments in the final estimate and payment. The OWNER will pay the estimate, less any sums that the OWNER may have deducted or retained under the provisions of the

Contract, as soon as practicable after final acceptance of the work, provided the Contractor has met the requirements of (1) through (8) below.

1. The Contractor has agreed in writing to accept the balance due or refund the overpayment, as determined by the OWNER, as full settlement of his account under the Contract and of all claims in connection therewith, or the Contractor, accepted the balance due or refunded the overpayment, as determined by the OWNER, with the stipulation that his acceptance of such payment or the making of such refund does not constitute any bar, admission, or estoppel, or have any effect as to those payments in dispute or the subject of a pending claim between the Contractor and the OWNER. To receive payment based on a FINAL PAYMENT CERTIIFCATE, The Contractor further agrees, by submitting a FINAL PAYMENT CERTIFICATE that any pending or future arbitration claim or suit is limited to those particulars, including the itemized amounts, defined in the original FINAL PAYMENT CERTIFICATE , and that he will commence with any such arbitration claim or suit within 15 calendar days from and after the time of final PAYMENT of the work and that his failure to file a formal claim within this period constitutes his full acceptance of the ARCHITECT's final estimate and payment. The overpayment refund check from the Contractor, if required, will be considered a part of any Acceptance Letter executed.

2. The Contractor has properly maintained the project, as specified hereinbefore.

3. The Contractor has furnished a sworn affidavit to the effect that the Contractor has paid all bills and no suits are pending (other than those exceptions listed, if any) in connection with work performed under the Contract and that the Contractor has not offered or made any gift or gratuity to, or made any financial transaction of any nature with, any employee of the OWNER in the performance of the Contract.

4. The surety on the contract bond consents, by completion of their portion of the affidavit and surety release subsequent to the Contractor's completion of his portion, to final payment to the Contractor and agrees that the making of such payment does not relieve the surety of any of its obligations under the bond.

5. The Contractor has furnished all required mill tests and analysis reports to the ARCHITECT.

* * * * * *

PART 4

SCOPE OF WORK

SCOPE OF WORK

PART 1 - SCOPE OF WORK

1.1 DESCRIPTION

A. Work Included: The design and furnishing of all materials, equipment and labor for the construction of RENOVATION OF FREDERICK DOUGLASS GYM PR 1206 and all necessary appurtenances and record drawings, surveys, and incidental work to provide a complete and serviceable project identified as:

PR 1206 / RENOVATION OF FREDERICK DOUGLASS GYM

B. Related requirements in other parts of the Contract Documents: General and Supplementary Conditions of the Contract for Construction.

C. Contractor's Duties:

1. In addition to provisions stipulated in other portions of the Contract Documents, the Contractor shall:

   a. Secure permits as necessary for proper execution and completion of the work.

   b. Notify (in writing) all residents and proprietors adjacent to construction site of work to be performed, more specifically the notice shall state the day and time construction will begin, hours of work, the name and phone number of the Contractor's Superintendent and an end date for the project.

D. The Contractor shall be totally responsible for all permits required and shall ensure that construction complies with all applicable local, state, and federal codes.

E. Provide an experienced, qualified, and competent Superintendent to oversee the Work and perform quality assurance inspections. Prior to starting construction, the proposed Superintendent's qualifications shall be submitted in writing to the City for approval. The approved Superintendent shall be expected to remain for the duration of the Project, unless the City or ARCHITECT deem him/her inadequate and requests his/her removal or the Contractor cannot continue his services to the Project for a reason or reasons that shall be communicated in writing to the City.

F. A replacement Superintendent shall be required to follow the same approval process as required for the original. The Superintendent shall provide to the City Inspector Construction Reports for each day of construction, the reports shall be in English, legible, and signed. Contractor shall provide PDF copies monthly. Reports shall include quantity control checks done daily

1.2 CONTRACTOR'S USE OF PREMISES

A. Work shall be scheduled as to not interfere with on-going area activities.

B. Coordinate use of premises and requirements for security under direction of City.

C. This is a smoke free construction zone. **NO SMOKING PERMITED WITHIN CONSTRUCTION ZONE.**

D. Assume full responsibility for the protection and safekeeping of products, under this Contract, stored on the site.

E. Obtain and pay for the use of additional storage or work areas needed for operation.

F. Contractor shall provide drinking water and toilet facilities for construction personnel; The City will not provide.

1.3 MAINTENANCE OF EXISTING UTILITIES OPERATION

A. Provide at least three weeks notice prior to interruption of utility services for temporary or permanent connections.

B. Keep interruption of utility services, and utility outages during disconnection, moving, and reconnection to a minimum.

C. Keys Energy shall be notified two weeks in advance in writing by the contractor for any KEYS support equipment required by the Contractor during any excavation. (e.g., Power poles next to excavations requiring support, etc.) No additional payment will be paid for this coordination.

****

PART 5

SPECIFICATIONS AND DRAWINGS

PROJECT MANUAL

Construction Documents
Bid Set

RENOVATION OF

FREDERICK DOUGLASS RECREATION CENTER

111 Olivia St, Key West, Florida 33040

HAYES | CUMMING ARCHITECTS, P.A.
PROJECT NUMBER: 12.0D01B

MARCH 28, 2016

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City of Key West
Renovation of Frederick Douglass Recreation Center
Key West, Florida

DATA SHEET

PROJECT:

Title: Renovation of Frederick Douglass Recreation Center
Comm. No.: 12.0D01B

OWNER:

Title: City of Key West
Address: 3140 Flagler Avenue
Key West, FL 33040
Contact: L. Kreed Lowell
Project Manager
Phone No.: (305) 809-2964

ARCHITECT:

Company: Hayes | Cumming Architects, P.A.
Address: 2210 Central Avenue, Suite 100
Saint Petersburg, FL 33712
Contact: Andrew M. Hayes, AIA, LEED BD+C
Phone No.: 727.321.0900

Signed & Sealed by:

3/28/2016

Andrew M. Hayes, AIA
FL AR 0016166

STRUCTURAL:

Company: McCarthy and Associates, Inc.
Address: 2555 Nursery Road, Suite 101
Clearwater, Florida 33764
Contact: E. Michael McCarthy, P.E.
Phone No.: (727) 536-8772

Engineer of Record:

LANDSCAPE ARCHITECT:

Company: Anderson/Lesniak Assoc. Inc.
Address: 4921 S. Westshore Blvd.
Tampa, FL 33611
Contact: John J. Lesniak
Phone No.: (727) 865-3775

Landscape Architect of Record:

MECHANICAL / PLUMBING / ELECTRICAL ENGINEERING:

Company: Diamondback Engineering
Address: 1801 North Himes Ave.
Tampa, Florida 33607
Contact: Ralph G. Elenbaum, P.E.
Phone No.: (813) 517-8256

Engineer of Record:

City of Key West
Renovation of Frederick Douglass Recreation Center
Key West, Florida

PROJECT NO.: 12.0D01B

TABLE OF CONTENTS

PROJECT NO.: 12.0D01B

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

DIVISION 09 – FINISHES

DIVISION 10 – SPECIALTIES

DIVISION 11 – EQUIPMENT

Not Used

DIVISION 12 – FURNISHINGS

Not Used

PROJECT NO.: 12.0D01B

DIVISION 13 – SPECIAL CONSTRUCTION

Not Used

DIVISION 14 – CONVEYING SYSTEMS

Not Used

DIVISION 15 – MECHANICAL

DIVISION 16 – ELECTRICAL

END OF TABLE OF CONTENTS

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SECTION 01100 - SUMMARY

1.1 PROJECT INFORMATION

A. Project Identification:

1. Renovation of
FREDERICK DOUGLASS RECREATION CENTER

2. Project No. 12.0D01

B. Owner:

CITY OF KEY WEST

1. Owner's Representative: L. Kreed Howell, LEED AP BD+C, Senior Construction Manager, City of Key West (305) 809-3963

C. Other Owner Consultants:

1. None

D. Construction Manager:

JBD CONSTRUCTION, INC.

1. John Dwyer, General Contractor, Phone (813) 982-2903

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project: The scope of work shall consist of an addition of approximately 2,700 square feet to the northwest of the existing building. The addition shall consist of an open multipurpose area, ADA compliant restroom, storage areas for clubs and organizations. The main space shall include a moveable partition for subdivision during simultaneous events.

B. Type of Contract: Single prime contract.

C. Work by Owner:

1. Preceding Work: Owner to remove outdoor furniture prior to Contractor mobilization. Owner to coordinate deadline for removal with Contractor.

2. Concurrent Work: None anticipated

3. Subsequent Work: Owner to install furniture, fixtures and equipment after final completion.

D. Work Under Separate Contracts:

1. Preceding Work: None

2. Concurrent Work: None

3. Subsequent Work: None

E. Purchase Contracts: Owner will negotiate multiple direct purchase contracts.

1. List to be provided at the time the construction contract is finalized and signed.

F. Owner-Furnished Products:

1. None

G. Contractor-Furnished, Owner-Installed Products:

1. None

H. Use of Site: Limited to work in areas indicated.

1. Limits of Site Disturbance: Ten 10 feet beyond constructed permeable surfaces (such as building, paving, stormwater detention facilities, and playing fields).

2. Owner occupancy and use by public is not allowed during construction.

I. Owner's Occupancy Requirements:

1. Owner occupancy after all areas of construction are completed.

J. Work Restrictions: See Conditions of the Contract

K. Miscellaneous Provisions: None

L. Project Duration: 305 calendar days - from issuance of Notice to Proceed through Final Completion.

END OF SECTION 011000

SECTION 01330 - SUBMITTAL PROCEDURES

1.1 DEFINITIONS

A. Action Submittals: Information that requires Architect's responsive action.

B. Informational Submittals: Information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.2 PROCEDURES

A. Electronic copies of digital data files of the Contract Drawings will [**not**] be provided by Architect for Contractor's use.

B. Processing Time:

1. Initial Review: 15 calendar days.
2. Resubmittal Review: 10 calendar days.
3. Sequential Review: 21 calendar days.
4. Concurrent Consultant Review: 15 calendar days.

C. Transmittal Form: General Contractors Standard Form

D. Submittal Procedures:
1. Submit hardcopy via US mail, courier or hand delivery
2. Action Submittals: Submit five paper copies.
3. Informational Submittals: Submit three paper copies.
4. Certificates and Certifications Submittals: Includes signature of entity responsible for preparing certification

E. Delegated-Design Services Certification: In addition to other required submittals, submit and two paper copies of certificate, signed and sealed by the responsible design professional.

F. Contractor's Review:

1. Submittals: Marked with approval stamp before submitting to Architect.

G. Architect's Action:

1. Action Submittals: Stamped with an action stamp and returned.

a. Revise and Resubmit

b. Approved as Noted

2. Informational Submittals: Reviewed but not returned, or rejected if they do not comply with requirements.
3. Incomplete submittals will be returned without review.
4. Submittals Not Required: May not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to

perform as intended or that results in increased maintenance or decreased operational life or safety.

2. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Temporary Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be utilized for temporary operations area, ensure removal, relocation, or abandonment of such services/systems before cutting to prevent interruption to temporary operations area.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion

of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the renovated space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected site and building elements.

B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to selective demolition of individual parts of the Work.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

B. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Predemolition Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

B. Hazardous Materials

1. Hazardous materials will be removed by Owner before start of the Work.
2. If other materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

C. Storage or sale of removed items or materials on-site is not permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated structural mechanical or electrical elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Architect prior to the start of any demolition work.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
   1. Survey of Existing Conditions: Record existing conditions by use of measured drawings, and preconstruction photographs.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain. **NOTE: Temporary operations area NOT IN CONTRACT.**

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING - Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 01732

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SECTION 01770 - CLOSEOUT PROCEDURES

1.1 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection, complete the following.

1. Contractor's list of incomplete items (punch list) prepared on CSI Form 14.1A.

   a. Submit MS Excel electronic file.
   b. Submit PDF electronic file.
   c. Submit paper copies.

2. Owner advised of pending insurance changeover.
3. Warranties, maintenance service agreements, and similar documents submitted.
4. Releases, occupancy permits, and operating certificates submitted.
5. Project Record Documents submitted.
6. Tools, spare parts, and extra materials delivered.
7. Final changeover of locks performed.
8. Startup testing completed.
9. Test/adjust/balance records submitted.
10. Temporary facilities removed.
11. Owner advised of heat and utility changeover.
12. Changeover information for use, operation, and maintenance submitted.
13. Owner's personnel instructed in operation, adjustment, and maintenance of equipment and systems, including demonstration and training videotapes submitted.
14. Final cleaning performed.
15. Touchup performed.

1.2 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection, complete the following:

1. Final Application for Payment submitted.
2. List of incomplete items (punch list) endorsed by Architect as completed or otherwise resolved for acceptance.
3. Evidence of continuing insurance coverage submitted.
4. Final pest-control inspection report and warranty submitted.

1.3 SUBMITTAL OF PROJECT WARRANTIES

A. Partial Occupancy: Submit warranties within 15 days of completion of designated portions of the Work that are occupied or used by Owner.

B. Organize warranty documents based on Project Manual and bind in heavy-duty, three-ring, vinyl-covered, loose-leaf binders.

C. Scan warranties and bonds into a single indexed electronic PDF file.

1.4 FINAL CLEANING

A. Cleaning Agents: Comply with Green Seal's GS-37 and California Code of Regulations maximum allowable VOC levels.

B. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.

C. Replace disposable air filters and clean permanent air filters.

D. Clean ducts, blowers, and coils if units were operated without filters during construction.

E. Clean HVAC system in compliance with NADCA Standard 1992-01.

1.5 REPAIR OF THE WORK

A. Repair or remove and replace defective construction. Where damaged or worn items cannot be repaired or restored, provide replacements. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 01770

SECTION 02220 - SITE PREPARATION, EXCAVATION AND EARTHWORK FOR FOUNDATIONS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. All requirements of Division 0 and Division 1 forms a part of this section.

B. A subsurface investigation and soils report have been completed for this project. All work in this section shall comply with the soils report.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with federal, state, local, and other duly constituted authorities in matters pertaining to:

1. Permitting
2. Disposal of and hauling of waste material
3. Safety precautions
4. Barricades
5. Protection of environmental matters

1.3 SCOPE OF WORK

A. Perform all work specified herein as indicated within the grading area, i.e., that area within which earth grades are shown to be approximately 5 feet outside building perimeter. Remainder of property is to be left undisturbed, except as otherwise authorized for such purposes as spoil or stock pile areas, temporary ditches, swales and/or haul or access roads, in which case such authorized areas become part of the grading area. This work includes, but is not limited to, the following:

1. Clearing and grubbing of vegetation and debris of all kinds.
2. Stripping.
3. Excavating to grade and subgrades.
4. Excavating and backfilling for foundations.
5. Providing finish load-bearing subgrades for foundations.
6. Disposal of removed materials.
7. Dewatering.
8. Laboratory testing.

B. Related work not specified under this subdivision.

1. Excavation of backfill for utilities.
2. Finish grading.

1.4 GENERAL

A. Contractor shall obtain a copy of the soils report for use with this section.

B. The Contractor shall examine all drawings and the specifications, consulted the records of adjacent construction and of any existing utilities, and the connections, if any, and noted all conditions and limitations which may influence the work required by this Section.

C. Where recommendations presented in the soils report conflict with this section, the soils report shall govern.

1.5 EXISTING STRUCTURES

A. Care shall be exercised during excavation, backfilling, and compaction work to avoid damage to existing buildings or foundations.

1.6 PROTECTION

A. Protect trees and dispose of all removed trees including stumps and roots.

B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave in or loose soil from falling into excavation.

E. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

F. Control grades in vicinity of excavations to prevent surface water running into excavated areas.

G. Conduct earthwork operations under this division to insure against rainwash and silting of watercourses, ponds and adjoining property resulting therefrom. Should such silting occur, restore such areas to their original condition if outside the grading areas, or to lines, grades and conditions shown specified if within grading areas, all at no cost to the Owner.

PART 2 - MATERIALS

2.1 FILL MATERIALS

A. Fill material shall be as specified in the soils report or at least clean fine sand, free of rubble, organics, clay, debris and other unsuitable material. Fill should be tested and approved prior to acquisition.

B. Source of new material and length of haul shall be the Contractor's responsibility.

C. Drainage fill: Crushed stone or gravel so that 100% passes 1-1/2" sieve with not more than 10% passing a No. 4 sieve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

1. Identify known underground utilities. Stake and flag locations.
2. Identify and flag surface and aerial utilities.
3. Notify companies to remove and relocate utilities as required.
4. Maintain and protect existing utilities remaining which pass through work area.

B. If required, perform remedial de-watering prior to any earthwork operations.

C. Clear and grub site as defined in the soils report.

D. Proof-roll the sub-grade in accordance with the soils report and under the observation of the testing laboratory. Proof-rolling will help locate any zones of especially loose or soft soils not encountered in the soil test borings. Then undercut, or otherwise treat these zones as recommended by the testing lab.

E. Testing the sub-grade for compaction will be as directed by the testing laboratory and as shown on the structural drawings.

3.2 FILL

A. Fill in areas where required shall be placed in loose lifts as directed by the soils report.

B. In load-bearing areas, fill shall be compacted as recommended in the soils report or at least to 95% of maximum modified Proctor dry density. A moisture content within two percent (2%) points of optimum indicated by the modified Proctor test (ASTM D-1557) is recommended.

C. Perform compliance tests within the fill as directed by the testing lab.

3.3 EXCAVATION

A. Excavation shall conform to the dimensions and elevations shown on the drawings, but excavation lines shall be such as to provide sufficient clearance for the proper execution of the work to be installed. Allowances shall be made for work and inspections. Bottom of all excavations shall be trimmed to the levels indicated and sloping surfaces cut in steps shown on drawings. After carrying the excavation to the required depth, the Contractor shall await the inspection and testing of the bearing soil.

B. Control of ground water, including all necessary equipment, to maintain all excavated areas in a dry condition shall be the responsibility of the Contractor.

C. Sides of temporary excavations can be cut to maximum slope of 1:1. However, no claim may be made by the Contractor for extra work for damages resulting from slope stability failure.

D. The bottom of foundation excavations shall be compacted after excavation to densify any soils loosened in the excavation process. Backfill soils placed adjacent to footing or walls shall be carefully compacted with a light rubber tired roller or vibratory plate compactor to avoid damaging the footings and walls. Approved sand fills placed in footing excavations above the bearing level, in trench excavations, and in other areas which are expected to provide slab support and foundation embedment constraint shall be placed in loose lifts not exceeding 6 inches and shall be compacted to a minimum of 95% of the maximum modified Proctor dry density.

E. Test all footing cuts for compaction to a depth of 1 foot, as directed by the testing laboratory.

3.4 DEWATERING

A. Refer to the soils report for an estimate of seasonal high ground water table.

B. The geotechnical testing laboratory shall determine the depth of ground water just prior to construction to determine what dewatering will be required.

C. Water control will consist of, but not necessarily be limited to, well points, sumps, and pumps, in conjunction with berms and any needed ditches. Deep wells will not be permitted.

D. Approval by the Architect of data submitted shall not relieve the Contractor of full responsibility for adequacy of dewatering system. In the event that during the progress of the work it is determined that the dewatering system is inadequate, the Contractor shall install and operate such additional dewatering equipment and/or make such changes in the system or plan of operation as may be necessary to perform the dewatering system in an adequate manner.

E. Groundwater shall be maintained at least 24 inches below all earthwork, foundations, and compacted surfaces, or as directed by the testing laboratory.

3.5 BACKFILL UNDER AND AROUND BUILDING AREA

A. All debris shall be removed from excavations prior to backfilling and filling.

B. Backfill under and around building area shall be placed in loose layers not exceeding 12" and shall be compacted as defined in the soils report or at least to a density equal to 95% of the modified Proctor maximum dry density as per ASTM D698-70.

C. Backfill in electrical plumbing and mechanical trenches shall be compacted to previously specified density.

3.6 GRADING

A. Grade areas to lines and elevations indicated, including adjacent transition areas. Smooth finish surface within specified tolerances. Compact and bring to uniform levels or slopes between points where elevations are shown or between such points and existing grades.

B. Unless shown on the drawings, slope the grade evenly to provide drainage away from the building.

C. Complete the grading operations after the building has been finished, utilities installed, site improvements constructed, and all excavated materials, rubbish, and debris removed from the site. Leave grade for lawns and planted areas clean and at required grades.

3.7 TESTING

A. A qualified licensed geotechnical testing laboratory shall be retained to perform all necessary quality control testing for earthwork.

B. All testing shall comply with the project soils report.

C. See structural drawings for a minimum testing program.

D. Provide samples of materials proposed for fills as required. Cooperate with laboratory personnel in obtaining samples, and during quality control testing.

3.8 SPECIAL NOTES

A. Fill material shall not be placed against walls until 7 days after grouting of masonry cells. Compaction of exterior fill and interior backfill shall not be performed until wall grout has cured 14 days.

B. Do not use drum compactor within 6 feet of walls. Compaction within 6 feet of walls shall be accomplished with a hand operated vibratory compactor.

END OF SECTION 02220

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, plants and grass to remain.
2. Removing existing trees, shrubs, plants and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting and capping or sealing site utilities.
7. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control requirements within the Civil Drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Removal of underground utilities is included in Division 2 Sections covering site utilities.

3.5 CLEARING AND GRUBBING

A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 02230

SECTION 02361 - TERMITE CONTROL

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. Soil treatment with termiticide.
2. Wood treatment with borate.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for wood preservative treatment by pressure process.
2. Division 7 Section "Sheet Metal Flashing and Trim" for custom-fabricated metal termite shields.

1.3 PERFORMANCE REQUIREMENTS

A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

1.4 SUBMITTALS

A. Product Data: For termiticide and borate.

1. Include the EPA-Registered Label for termiticide and borate products.

B. Product Certificates: For termite control products, signed by product manufacturer.

C. Qualification Data: For Installer of termite control products.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of Florida and Pinellas County to apply termite control treatment and products in jurisdiction where Project is located.

B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products through one source.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination" to schedule application of termiticide products.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.7 COORDINATION

A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

B. Apply borate treatment after framing, sheathing, and exterior weather protection is completed but before electrical and mechanical systems are installed.

C. Install bait-station monitoring system during construction to determine areas of termite activity.

D. Install bait-station system after construction, including landscaping, is completed.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Continuing Service: Beginning at Substantial Completion, provide 12 months continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, and terms for agreement period; and terms for future renewal options.

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: Subject to compliance with requirements, provide products by one of the following:

1. Termiticides:

a. Aventis Environmental Science USA LP; Termidor.
b. Bayer Corporation; Premise 75.
c. Dow AgroSciences LLC; Dursban TC or Equity.
d. FMC Corporation, Agricultural Products Group; Talstar, Prevail FT or Torpedo].
e. Syngenta; Demon TC.

2. Borates:

a. Nisus Corp.; Bora-Care, Jecta.
b. NovaGuard Technologies, Inc.; Armor-Guard, Shell-Guard.
c. U.S. Borax Inc.; Tim-Bor.

2.2 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

2.3 WOOD TREATMENT

A. Borate: Provide an EPA-registered borate complying with requirements of authorities having jurisdiction, in an aqueous solution for spray application and a gel solution for pressure injection, formulated to prevent termite infestation in wood. Provide quantity required for application at the label volume and rate for the maximum diffusible borate concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Crawlspaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
4. Masonry: Treat voids.
5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 APPLYING BORATE TREATMENT

A. Application: Mix wood treatment borate solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of borate, according to manufacturer's EPA-Registered Label, so that wood framing, sheathing, siding, and structural members subject to infestation receive treatment.

1. Framing and Sheathing: Apply borate solution by spray to bare wood for complete coverage.
2. Wood Members Thicker Than 4 Inches (100 mm): Inject borate gel solution under pressure into holes of size and spacing required by manufacturer for treatment.
3. Exterior Uncoated Wood Trim and Siding: Apply borate solution to bare wood siding. After 48 hours, apply a seal coat of paint or stain as specified in Division 9.

END OF SECTION 02361

SECTION 02751 - CEMENT CONCRETE PAVEMENT

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 exterior cement concrete pavement for the following:

1. Sidewalks.
2. Curbs and gutters.
3. Walkways.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.

C. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For manufacturer, testing agency.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

F. Field quality-control test reports.

G. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M 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 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. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials

and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete producer.
d. Concrete pavement subcontractor.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. 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.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A 82, as drawn, galvanized.

I. Deformed-Steel Wire: ASTM A 496.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain, deformed.

K. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and

dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of, the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I, II, I/II, III, V,, gray, white. Supplement with the following:,

   a. Fly Ash: ASTM C 618, Class C, F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag, IP, portland-pozzolan, I (PM), pozzolan-modified portland, I (SM), slag-modified portland, cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, 4M, 1N, <Insert class> coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm), 1 inch (25 mm), 3/4 inch (19 mm), nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or, ASTM D 1752, cork or self-expanding cork.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types I and II, non-load bearing, IV and V, load bearing,, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
4. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements, <Insert locations> with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm), require correction according to requirements in Division 2 Section "Earthwork."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent, epoxy bonding adhesive, at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 15 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement,:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm), 3/8-inch (10-mm), radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover 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- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm), 3/8-inch (10-mm), radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

   1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. 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 air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on pavement surface. Tamp aggregate into plastic concrete, and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).

1. Spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.

3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

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 (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in 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. Maintain continuity of coating and repair damage during curing period.

3.10 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage, Engage, a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: 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 1 composite sample for each 100 cu. yd. (76 cu. m), 5000 sq. ft. (465 sq. m), or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 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 (3.4 MPa).

D. Test results shall be reported in writing to Engineer, 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.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. 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 Engineer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

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SECTION 02930 - PLANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes provisions for the following items: Trees, Palms, Shrubs, Ground Cover, Finish Grading, Lawns, Soil Amendments, and Initial Maintenance of landscape materials.

1.3 QUALITY ASSURANCE

A. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to the Landscape Architect, together with proposal for use of equivalent material.

B. Analysis and Standards: Package products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made with methods established by the Association of Official Agriculture Chemists, wherever applicable.

C. Trees, Shrubs and Ground Cover: Provide trees, shrubs, and ground cover of quantity, size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of Florida #1 standards as given in, Grades and Standards for Nursery Plants, latest edition, published by the Florida Department of Agriculture and Consumer Services. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

D. The Landscape Architect may inspect plant materials either at place of growth or at site before planting for compliance with requirements of specifications. Landscape Architect retains right to further inspect plant materials for size and condition of root systems, insects, and injuries, and to reject unsatisfactory material at any time during progress of work. Remove rejected materials immediately from project site.

E. Pre-Installation Conference: Contractor must attend conference at Project site with Landscape Architect and Owners Representative to discuss planting procedures, scheduling, and requirements for approval.

F. All existing trees within the limits of the work shall be pruned by a licensed professional

in a manner that minimizes disturbance of areas not under construction. Wood and debris shall become the property of the contractor and shall be removed from the site. Contractor shall protect root areas and crowns of trees not designated for work under this contract from damage from operations and equipment. Provide barricades as per the details on the plan.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Contractual Conditions and Division one Specification Sections.

B. Manufacturer's certified analysis for fertilizer materials and mulch type.

C. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration while stored at site.

B. Trees, Shrubs and Ground Cover: Provide Container Grown trees, shrubs and ground cover. Do not prune prior to delivery. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery.

C. Deliver plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set plant stock in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

D. Do not remove container-grown stock from containers until planting time.

1.6 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Contractor will be responsible for any damages occurring due to failure to locate underground utilities. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect and

Owner's Representative before planting.

C. Installer must examine Sub-grade, verify elevations, and observe conditions under which work is to be performed, and notify Landscape Architect of unsatisfactory conditions. The installer shall not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

1.7 SEQUENCING AND SCHEDULING

A. Planting Time: Proceed with, and complete landscape work as rapidly as portions of site become available. Plant shrubs, ground cover and sod after installation of underground irrigation.

B. Coordination with lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Landscape Architect.

1.8 SPECIAL PROJECT WARRANTY

A. Warranty trees, shrubs and ground cover, for a period of one year after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Installer's control.

B. Remove and replace trees, shrubs, or ground cover found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs, which are in doubtful condition at end of warranty period.

C. Another warranty inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection. Only one replacement (per tree, shrub or plant) will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.

PART 2 PRODUCTS

2.1 SOIL AMENDMENTS

A. Mulch: Organic mulch free from deleterious materials and consisting of the following: Pine Bark Nuggets, Grade "A" or approved equal.

B. For all ground cover, shrubs, trees, and palms provide Osmocote Plus15-9-12 slow release formulation to the soil surface of each plant pit at the manufacturer's recommended rate.

2.2 PLANT MATERIALS

A. Quality: Provide trees, shrubs, and other plants of size, genus, species, and variety shown and scheduled for Landscape work and complying with recommendations and requirements of Florida #1 standards for type and species required.

B. Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by Florida #1 Standards for type and species required. Provide single stem trees except where special forms are listed.

C. Shrubs and Ground Cover: Provide shrubs and ground cover of the height listed and with not less than minimum number of runners required by Florida #1 for type and height of plant material required.

D. Container Grown Plants: All container grown plants shall be well rooted and established in the container in which they are delivered to the site, and shall have been in that container long enough for the fibrous roots to hold the soil together when the plant is removed form the container. Plant shall not be root-bound in the container. Container grown plants shall not be removed from the container until immediately before planting and with all due care to prevent damage to the root system.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

A. Pre-emergent Herbicide: "Ronstar" pre-emergent herbicide or approved equal.

B. Stakes and Guys: Rough-sawn, sound wood, 2-by- 2 inch nominal by length indicated, pointed at one end or lodge poles. Flexible ties: Wide rubber or elastic bands or straps of length required to secure stakes to trees.

PART 3 EXECUTION

3.1 PREPARATION GENERAL

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Landscape Architect's acceptance before start of planting work. Make minor adjustments as may be required.

3.2 TREE PRUNING

A. Before construction starts, all existing trees within the limits of work shall be pruned as follows: Prune trees to minimum 12' clear trunk or as specified on plans. Remove any diseased trunks or branches, and remove weak or crossed branches. All roots to be removed during the site-clearing phase shall be severed clean at the perimeter of

the designated protected radius.

B. Cutting back or drop crotch pruning shall consist of the reduction of tops, sides, under branches or individual limbs. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. It is necessary to pre-cut branches too heavy to handle to prevent splitting or peeling the bark. Attention shall be taken to the symmetrical appearance of the canopy.

C. Use clean, sharp tools, disinfect where necessary to prevent the spread of disease. Limbs and debris from this work shall be transported and not dragged over the site.

3.3 PREPARATION OF PLANTING SOIL

A. Before mixing, clean existing soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Aerate existing soil before backfilling. Backfill as specified below.

3.4 EXCAVATION FOR TREES, SHRUBS AND GROUND COVER

A. For all landscape materials (trees, shrubs and ground cover), make excavations at least twice as wide as the ball diameter and 1”- 2” less than the ball depth. Fill excavations for trees, shrubs, and ground cover with water and allow water to percolate out prior to planting.

3.5 PLANTING TREES, SHRUBS AND GROUND COVER

A. Set stock on undisturbed existing soil, plumb and in center of pit with top of ball 1”- 2” above the elevation of adjacent finished grades. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. Add Osmocote fertilizer to the surface of each plant pit before mulching

B. Mulch pits, trenches, and planted areas. Provide not less than five-inch thickness of mulch, and work into top of backfill and finish level with adjacent finish grades. Keep mulch minimum 4” away from tree trunks.

C. Prune new trees and shrubs in accordance with standard horticultural practice, only if needed. Retain required height and spread. Do not cut tree leaders, and remove only injured or dead branches.

3.6 MISCELLANEOUS LANDSCAPE WORK

A. Pre-Emergent Herbicide: Apply "Ronstar" or approved equal to all mulch areas according to the manufacturer's recommended rate. Contractor shall be responsible to re-apply appropriate herbicide to eradicate all remaining weeds and maintain a weed free condition in all areas throughout all landscape operations.

B. Staking: Stake trees and palms immediately after planting, as indicated in the details.

3.7 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain palms, trees, shrubs, and ground cover until final acceptance, but in no case, less than the following period: 30 days after substantial completion of planting.

C. Maintain trees, shrubs, and ground cover by pruning, and weeding as required for healthy growth. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Spray as required to keep plants free of insects and disease.

3.8 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.9 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.

B. When landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 02930

SECTION 03001 – CONCRETE, CONCRETE REINFORCEMENT, CAST-IN-PLACE CONCRETE & FOUNDATIONS

PART 1 - GENERAL

1.1 GENERAL

A. Quality Standard: See specifications on Sheets S-001& S-002.

PART 2 - PRODUCTS

2.1 Product Standard: See specifications on Sheets S-001& S-002.

PART 3 - EXECUTION

3.1 Execution Standard: See specifications on Sheets S-001 & S-002.

END OF SECTION 03001

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SECTION 03300 - CAST-IN-PLACE CONCRETE

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 DESCRIPTION

A. SCOPE OF WORK

1. Provide all labor, materials, equipment and services necessary to complete all cast-in-place concrete work, including formwork, reinforcing steel and all related work as shown and specified, except as specifically excluded hereinafter.
2. In addition to construction of cast-in-place concrete work, the work includes the items listed below:
   a. Setting anchor bolts, frames, and other items indicated to be embedded in concrete
   b. Grouting of structural steel bearing on concrete
   c. Concrete curbs
   d. Dowels for masonry walls
   e. Concrete walks
   f. Concrete pavement
   g. Laboratory field testing services
3. Cooperate with affected personnel or contractors in setting and/or fastening sleeves, piping, inserts, conduits, hangers, ties and similar items in the forms, where such items are to be furnished and installed under other subdivisions of these specifications.

B. RELATED WORK NOT SPECIFIED UNDER THIS SUBDIVISION

1. Foundations and pads not shown on architectural, civil or structural drawings.
2. Furnishing steel frames and grating.
3. Furnishing miscellaneous steel shapes and plates embedded in concrete.
4. Furnishing anchor bolts for structural steel.
5. Furnishing piping and conduit embedded in concrete.

1.3 QUALITY ASSURANCE

A. APPLICABLE STANDARDS

1. Provide all materials and perform all work in accordance with the latest issue of ACI 301 "Standard Specifications for Structural Concrete A" and the reference specifications listed therein.

2. The applicable provisions of the latest issue of the following ACI and CRSI Standards are made a part of these specifications. Where the provisions of any reference specification conflict with those of ACI 301, the more stringent provisions govern.

ACI NUMBER	TITLE
117	Standard Specifications for Tolerances for Concrete Construction
226	Ground Granulated Blast-furnace Slag
301	Standard Specification for Structural Concrete for Buildings
302.1R	Guide for Concrete Floor and Slab Construction
304.R	Guide for Measuring, Mixing, Transporting and Placing Concrete
304.2R	Placing concrete by Pumping Methods
305R	Hot Weather Concreting
306R	Cold Weather Concreting
308	Standard Practice for Curing Concrete
309R	Guide for Consolidation of Concrete
315	Manual of Standard Practice for Detailing Reinforced Concrete Structures
318	Building Code Requirements for Reinforced Concrete
347	Recommended Practice for Concrete Formwork
70-56	Guide for Use of Epoxy Compounds with Concrete – Committee 503 Report
75-18	Concrete Committee 503 Report. Cold Weather Concreting.

CRSI NUMBER	TITLE
63	Recommended Practice for Placing Reinforcing Bars

1.4 SUBMITTALS

A. Submit, not less than 21 days prior to placing of concrete, the following proposed concrete mix design data:

1. Intended usage and location for each type
2. Mix design for each type

3. Cement content in pounds per cubic yard
4. Coarse and fine aggregate in pounds per cubic yard
5. Water-cement ratio by weight
6. Cement type and manufacturer
7. Slump range
8. Air content range
9. Admixture types and manufacturers
10. Percent of admixtures by weight
11. Strength test data required to establish mix design

B. Submit complete detail and placing shop drawings for all reinforcing steel including accessories that have been reviewed and stamped by the General Contractor.

C. Refer to Section 01300 for all submittals.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement - ASTM C 150, Type I. Type III may be used where authorized by the Engineer.

B. Air-Entraining Admixtures - ASTM C 260, Darax AEA, W. R. Grace & Company, SIKA AER, SIKA, MB-AE90, Master Builders, Air Mix, Euclid Chemical Corp.

C. Water-Reducing Admixtures - ASTM C 494, Type D. WRDA-64, W.R. Grace & Company Plastiment, SIKA, Pozzolith N, Master Builders.

D. No accelerators, retarders or admixtures containing chlorides will be permitted.

E. Use fresh, clean and drinkable water for concrete.

F. For normal weight concrete use coarse and fine aggregate to conform to ASTM C33.

G. Super Plasticizer ASTM C494 Type F or G where authorized by the Engineer.

H. Fly-ash ASTM C618 Type C618.Maximum loss on ignition shall not exceed 3% by weight. The combined weight of fly-ash shall not exceed 20 percent of the total weight of cementitious material. The fly-ash present in blended cement conforming to ASTM C595 shall be included in the calculated percentage. Do not use for architectural concrete.

I. Ground granulated blast-furnish slag ASTM C989.the combined weight of GGBFS shall not exceed 50 percent of the total weight of cementitious material. Slag used in blended hydraulic cement confirming to ASTM C595 shall be included in the calculated percentage.

2.2 PROPORTIONING

A. Concrete Strength – See structural drawings for minimum concrete compressive strength at 28 days.

B. PROPERTIES

1. Provide concrete having the general properties specified for each class of concrete with the following tables to provide workability and consistency so concrete can be worked readily into forms and around reinforcement without segregation or bleeding, and to provide an average compressive strength adequate to meet acceptance requirements of ACI 301.

2.3 PRODUCTION OF CONCRETE

A. Concrete must be batched, mixed and transported in accordance with specifications for ready-mixed concrete ASTM C 94.

B. Concrete shall be batched to produce a slump of 4" plus/minus 1".Refer to 2.02B unless noted otherwise.

C. Provide at the site, delivery tickets for each batch of concrete showing the following:
1. Batch number, volume and date
2. Time of loading
3. Design 28-day compressive strength
4. Concrete type
5. Cement content in pounds per cubic yard
6. Water content in pounds per cubic yard
7. Admixtures in amount per cubic yard
8. Maximum amount of water that may be added at the job site.

D. Restrict the addition of mix water at the job site. Do not add water without the approval of the general contractor and do not exceed slump limitations or total allowable water to cement ratio. Use cold water from the truck tank and remix to achieve consistency. The reports shall indicate how much water was added at the job site. Note on delivery ticket amount of water added and name of person authorizing.

E. During hot weather, conform to the detailed recommendations of ACI 305.

F. When air temperature is between 85 and 90 degrees F., reduce mixing and delivery time to 75 minutes. When air temperature is higher than 90 degrees, reduce mixing and delivery time to 60 minutes.

G. Concrete should be deposited as nearly as practicable to its final position to avoid segregation of materials due to re-handling or flowing.

H. Concreting should be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.

I. The use of the following is prohibited:
   1. Partially hardened concrete
   2. Contaminated concrete
   3. Re-tempered concrete
   4. Concrete that has been re-mixed after it has taken its initial set.

J. After concreting has been started, it should be carried on as a continuous operation until placing of a panel or section, as determined by its boundaries or joints, is completed.

K. All concrete should be thoroughly consolidated by suitable means during placement and should be worked around reinforcement and embedded fixtures and into corners of forms.

2.4 PLACING CONCRETE

A. GENERAL

1. Inner surfaces of conveying equipment must be free of hardened concrete and foreign materials.
2. All reinforcing bars are to be tied in proper position prior to placing concrete.
3. Provide sufficient time for inspection of all preparatory work before proceeding with the placing of concrete.
4. Immediately prior to placing concrete, sprinkle semi-porous sub-grades sufficiently to eliminate suction and seal porous sub-grades, except where a vapor barrier is used.
5. Deposit concrete in forms in horizontal layers continuously, no deeper than 18 inches. Horizontal cold joints will not be permitted. Fill forms completely using methods to ensure even distribution of aggregate around reinforcement and into corners of forms.
6. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time to 75 minutes. When air temperature is higher than 90 degrees F, reduce mixing and delivery time to 60 minutes.
7. Concrete shall have a wet cure time of 7 days minimum at 50 degrees minimum temperature.

8. Concrete shall be deposited as nearly as practicable to its final position to avoid segregation of materials due to re-handling or flowing.
9. Concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.
10. The following conditions are prohibited:
    a. Partially hardened concrete.
    b. Contaminated concrete.
    c. Re-tempered concrete.
    d. Concrete that has been re-mixed after it has taken its initial set.
11. After concreting has been started, it shall be carried on as a continuous operation until placing or a panel or section, as determined by its boundaries or joints, is completed.

B. CONSOLIDATION

1. Consolidate concrete by vibration in accordance with the detailed recommendations of ACI 309.
2. Internal vibrators must be used in beams, girders and framed slabs and along bulkheads or slabs-on-grade to thoroughly consolidate the concrete. Do not use grossly oversized equipment.
3. Do not use vibrators to transport concrete within forms.

C. FINISHING

1. Finish concrete slabs in accordance with the finishes and tolerances as specified in ACI 301, and the detailed recommendations in ACI 302.Confirm all finishes with Architect.
2. Dusting of slabs with cement or other materials to absorb excess bleed water is strictly prohibited.

ITEM	TOLERANCE CLASS	FINISH
Exterior Pavement	B	Broom or belt
Exterior Walks/Curbs	B	Fine broom
Interior Slabs	A	Troweled
Exterior Steps	A	Nonslip

3. For flat, very flat and super flat floors, "F" numbers are required for defining flatness and levelness. Refer to ACI 301.1R, Fig. 8.15.1.1, for minimum required "F" numbers for type of slab use.

D. NONSLIP FINISH

1. Give surface a dry shake application as specified in ACI 301 using crushed selected abrasive aggregate of aluminum oxide. The rate of application of blended mixture should not be less than 25 pounds per 100 square feet of surface.

2. Acceptable products are:

TYPE	MANUFACTURER
Grip-It	L&M Construction Chemicals
Frictex N.S.	Sonneborn
Nonslip	Euclid Chemical Co.
Emag 20	Lambert Corp.

2.5 REINFORCEMENT

A. GENERAL

1. Details of concrete reinforcement and accessories not covered herein or shown on drawings to be in accordance with ACI 315.
2. Reinforcement is to be secured in proper position and thoroughly clean of loose rust, scale, grease or other coatings.

B. REINFORCING MATERIALS

1. Unless otherwise indicated, for all reinforcing shown provide deformed bars conforming to ASTM A 615, or a 616 Grade 60.
2. Smooth dowels - ASTM A 615 and A 616, plain bars having a minimum yield strength of 60,000 psi.
3. Welded wire fabric - ASTM A 185 plain wire fabric in flat sheets.
4. Plain wire to conform to ASTM A 82.
5. Accessories to conform to ACI 315.
6. Where reinforcing rods are used as supports, use rods no lighter than No. 5.
7. Where concrete surfaces are exposed, make those portions of all accessories in contact with the concrete surface or within 1/2 inch thereof, of plastic or stainless steel.
8. Reinforcing steel should be free of kinks and non-shop bends. Field bends should be only as approved by the architect.

C. FIBROUS REINFORCING(Synthetic)

1. Reinforcing fibers to be virgin 100% polypropylene fibers, per ASTM C1116, specifically manufactured for use in concrete, containing no reprocessed olefin materials, with the following minimum physical characteristics:
   a. specific gravity: 0.91
   b. modulus of elasticity: 500-700 KSI
   c. tensile strength: 70-110 KSI
   d. fiber length: multi-design gradation, 3/4" maximum.
2. Reinforcing fibers to be supplied by the following approved manufacturers:
   a. "FIBERSTRAND 100", Euclid Chemical Company
   b. "FIBERMESH INFORCE e^3 or STEALTH e^3", SI Concrete Systems

c. "FORTA SUPER-NET", Forta Corporation
d. "NYCON FIBERS", Nycon, Inc.

3. Fibers to be added in manufacturer's approved amount with a minimum of 1.5 pounds per cubic yard for poly and 1.0 pounds per cubic yard for nylon.
4. Concrete to be batched and mixed in accordance with fiber manufacturer's recommendations for uniform and complete dispersion of fiber bundles into single strands within concrete.
5. Reinforcing fibers may be used in concrete slabs-on-grade in lieu of WWF with approval of the engineer.
6. Submit product data for review and approval.
7. For a "non-hairy" surface use a monofilament fiber. Collated fibrillated fibers wear away in a short period of time.

D. FIBROUS REINFORCING (alternate to wwf on composite metal decks)

1. All fibers must meet the criteria in the Steel Deck Institute design manual (Publication No. 30).
2. Cold drawn steel fibers meeting the criteria of ASTM A820, at a minimum addition rate of 25 lb/yd3 (14.8 kg/m3) and possessing an average residual strength of at least 80 psi 550 kpa when tested ASTM C1399, may be used as a suitable alternative to the welded wire fabric specified for temperature and shrinkage reinforcement.
3. Reinforcing fiber to be supplied by the following approved suppliers:
   a. "NOVOMESH 850, or NOVOCON 1050" by SI Concrete Systems
   b. "DRAMIX 65/60" by Bekaert
4. Steel fibers do not replace rebar over girders, which are used to control negative moment.
5. Steel fibers are to be added at the batch plant and in accordance with the manufacturer's recommendations for uniform and complete dispersion.

PART 3 - EXECUTION

3.1 PLACING

A. GENERAL

1. Place reinforcing in conformance with the requirements of CRSI 63.Place reinforcement in proper position prior to placing concrete.Placing reinforcement during concrete placement will not be permitted.
2. Unless otherwise shown or indicated, provide minimum concrete protective covering for reinforcement as follows:
   a. Concrete deposited against the ground, 3".

b. Formed surfaces exposed to weather or in contact with the ground, 2" for reinforcing bars No. 6 or larger, and 1-1/2" for reinforcing bars No. 5 or smaller.
c. Interior surfaces, 1-1/2" for beams, girders and columns, 3/4" for slabs, walls and joists.
d. See drawing for special conditions.

3. Support reinforcing for slabs-on-grade on staggered concrete bricks or metal or plastic bar chairs and spacers with metal plates.
4. Unless specifically authorized, do not bend reinforcement partially embedded in hardened concrete.
5. Support and fasten all dowels in the formwork prior to placing concrete.Do not place dowels after concrete is in place.

3.2 JOINTS

A. CONSTRUCTION JOINTS

1. Construction joints not shown in the contract documents must be located and made to least impair the strength of the structure.
2. No horizontal construction joints will be permitted in beams, girders or slabs.
3. Location of any construction joint not shown is subject to review and acceptance by Engineer.
4. Reinforcing is continuous through all construction joints. Obtain bond by roughening surface of concrete in an acceptable manner which will expose aggregate uniformly and will not leave any latence, loosened particles or aggregate or damaged concrete at surface.
5. Construction joints shall be cleaned, wetted, and standing water removed.
6. All concrete shall be thoroughly consolidated by suitable means during placement and should be worked around reinforcement and embedded fixtures and into corners of forms.
7. Concrete wet cure time to be 7 days minimum at 50 degrees minimum temperature.

B. EXPANSION JOINTS

1. Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors bonded on only one side of joints) will not be permitted to extend continuously through any expansion joint.

C. DOWELED SLIP JOINTS

1. Use completely smooth round bars for dowels.
2. For construction joints, paint half of bar with red lead paint. When dry, coat painted end with satisfactory grease to insure against bond with concrete.
3. For control joints, paint and grease entire bar.

4. For expansion joints, paint, grease and provide a metal expansion cap for one end.
5. Place in forms to insure that bars are perpendicular to joint face. Stop reinforcement at doweled slip joints so that it will not extend through joint.

D. JOINT MATERIALS

1. Expansion joint filler non-bituminous type - ASTM D 1752, resin impregnated fiberboard Homosote 300 or Thermosetting Polyurethane, W. R. Meadows' Rescor. Asphalt impregnated materials are unacceptable.
2. Polyethylene Film - ASTM D 2103 minimum 6 mil.
3. Horizontal Joint Sealer - 2-component self-leveling urethane conforming to Federal Specification TT-S-227E, Type 1, Class A.Color to match concrete. Acceptable products are :

TYPE	MANUFACTURER
Daraseal-U	A. C. Horn
Sonolastic SL2	Sonneborn
Pourthane	W. R. Meadows

4. Vertical Joint Sealer - 1-component Polyurethane conforming to Federal Specification TT-S-002306, Type II, Class A, color to match concrete.

   Acceptable products are:

TYPE	MANUFACTURER
SIKAFLEX IA	SIKA
SONOLASTIC NPI	Sonneborn

5. Epoxy Joint Sealer - semi-rigid epoxy, MM80 as manufactured by Metzger McGuire Co., master fill 300 by Master Builders.
6. Epoxy Bond - 2-component 100 percent solids epoxy resin, amine cured.Acceptable materials are Concresive Series by Master Builders, Sonneborn's Epogrip and Epiweld 580 by Lambert Corp.
7. Epoxy Grout - Epoxy bond filled with suitable mineral filler, 100 percent passing the No. 100 sieve, in ratio to insure thixotropic action without impairment of adhesive properties.
8. Compressive Joint Material - expanded polystyrene having a compressive strength not less than 8 psi when the board is compressed to a deformation of 5 percent of its original thickness when tested in conformance with ASTM C 165, modified to change drying temperature to 150°F.
9. Felt - 30 pound asphalt or coal tar roofing felt ASTM D 226 or D 227.

E. PLACING DOWELS IN EXISTING CONCRETE

1. Use deformed reinforcing bars as dowels. Drill holes in existing concrete of size 1/2" larger in diameter than the dowel using power-driven drill with tungsten-carbide tipped bit ground to insure against oversize hole. Clean out holes with air.

Thoroughly swab surfaces of hole and embedded portion of dowel with epoxy grout. Force dowel into place. Wipe off excess grout and let set for not less than 12 hours at a temperature above 60°F.

3.3 FORMWORK

A. GENERAL

1. Provide and construct formwork in accordance with ACI 301 and 347.
2. Form design by P.E. registered in the State of Florida.
3. Observe and check formwork continuously while concrete is being placed to determine that there are no evidences of changes of elevations, plumbness, or camber and adjust forms as necessary. If, during construction, any such evidence or other defect appears, stop the work, remove concrete placed, if necessary, and repair formwork or supports before proceeding.
4. Earth cuts may be used as forms for footing vertical surfaces increase size 2 inch.
5. Forms and shoring is the responsibility of General Contractor.

B. FORMWORK MATERIALS

1. Make forms of lumber, plywood, metal or other materials suitable to provide the strength and tolerances specified herein before and the surface finishes specified hereinafter.
2. Forming exposed surfaces use any of the following materials as suitable for the specified finish, and to produce smooth uniform surfaces, true-to-line, in order that surfaces produced will require little finishing:
   a. New plastic-bonded natural plywood, American Plywood Association, HD Overlay Plyform Class I, Ext-APA, or equal.
3. For forming exposed surfaces use plywood, or other nonmetallic surfaces free from knots, warps, breaks, or other defects likely to cause irregular surfaces.
4. Provide commercial formulation form coating compounds with maximum VOC of 350 mg/1 that will not bond with stain or adversely affect concrete surfaces and will not impair subsequent surface treatments.

C. REMOVAL OF FORMS

1. Forms and shoring in the formwork supporting the weight of concrete, in beams, slabs and other structural elements are to remain in place until the concrete has reached its specified 28-day compressive strength.
2. Formwork and facing forms for members such as grade beams, foundation walls and spread footings not supporting the weight of concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from the removal operations.

3. Arrange shores and other vertical supports so that the non-load carrying form-facing material may be removed without loosening or disturbing the shores and supports.
4. Whenever the formwork is removed during the curing period, continue curing of both the unexposed and exposed concrete by one of the methods specified in section "Curing and Protection".

D. REMOVAL STRENGTH

1. Removal Strength - The concrete will be presumed to have reached its specified strength when additional test cylinders (paid for by contractor) are field cured along with the concrete they represent and have reached the strength specified.

3.4 REPAIR OF SURFACE DEFECTS

A. GENERAL

1. Patch all tie holes and repair all honeycombed and defective areas immediately after form removal.
2. For surfaces other than those to be backfilled against, use patching mortar.
3. For surfaces to be backfilled against, use mastic damp-proofing compound, except that where reinforcing is exposed, use patching mortar.
4. Remove all honeycombed and defective concrete down to sound concrete prior to patching. Thoroughly clean the holes of dirt and debris.

B. PATCHING MORTAR

1. Cut edges of honeycombed and defective concrete to form dove-tail (undercut) joints. No feather edges will be permitted.
2. Apply a chemical bonding agent to voided surface. An acceptable product is L&M Construction chemicals – Everbond or equivalent.
3. Patch the cement mortar as specified in ACI 301, or with proprietary patching compounds, except that proprietary patching mixtures may be not used on exposed surfaces.
4. Acceptable proprietary patching mixtures are:
   a. Euclid Chemical Corporation - Poly Patch
   b. SIKA - Sikaset Mortar
   c. Emaco R Series - Master Builders
   d. Lambert Corp, Lambco Vinyl Patch
   e. Sonneborn – Sonopatch

C. MASTIC DAMP-PROOFING COMPOUND

1. Patch full depth of hole and flush the surface with emulsified asphalt mastic heavy viscosity for trowel application. Prepare and place in accordance with manufacturer's directions. Acceptable products are:
   a. W. R. Meadows - Sealmastic Trowel Mastic
   b. Euclid Chemical Company - Damp-proofing Asphalt Coatings
   c. Sonneborn - Hydrocide 700 Mastic
   d. Lambert Corp – Waterban 60M

3.5 FINISHING OF FORMED SURFACES - GENERAL

A. After removal of forms, give surfaces of concrete the following finishes as specified in ACI 301.

SURFACE	FINISH
Unexposed	Rough Form
Exposed	Smooth Form
Exposed to Public View	Smooth Rubbed

3.6 CURING AND PROTECTION

A. GENERAL

1. Conform to the applicable detailed recommendations of ACI 301 and 308.
2. Hot weather curing to be in accordance with applicable ACI Standard 305.
3. All cast-in-place concrete must be maintained with minimal moisture loss at a relatively constant temperature for a minimum of 7 days following the placing of the concrete by the use of a water spray, water saturated fabric, moisture retaining membrane or liquid curing compound.
4. Full curing days will be determined by the cumulative number of days or fractions thereof during which the temperature of the air in contact with the concrete is above 50°F.
5. Cure slabs-on-grade for the first 72 hours by the use of:
   a. fog spraying
   b. ponding
   c. sprinkling
   d. continuously wet absorptive mats or fabric
   e. continue curing by use of moisture retaining cover until concrete has obtained its specified 28 day compressive strength
   f. or liquid curing compound after finishing process is completed.
   g. concrete wet cure time to be 7 days minimum at 50 degrees minimum temperature.
6. Submit materials and method of curing for review.

7. Do not use moisture retaining curing compounds for curing surfaces to receive the following coverings, unless it has been demonstrated that such compounds will not prevent bond of:
   a. Carpet
   b. Flexible flooring
   c. Ceramic tiled floors
   d. Other specified floor systems

B. MATERIALS

1. Where moisture retaining membranes or curing compounds are used for curing, provide only materials conforming to the following requirements:
   a. Polyethylene Film - ASTM C171, Type II
   b. Waterproof Paper - ASTM C 171, Type I
   c. Absorptive Cover - AASHTO M 182, Class 3, Burlap cloth made from Jute or Kenaf or ASTM C 440 cotton mats
   d. ASTM C309 spray on at max.

C. TEMPERATURE, WIND AND HUMIDITY

1. Do not permit concrete not fully cured to be exposed to excessive temperature changes or high winds.

3.7 EMBEDDED ITEMS

A. GENERAL

1. Prior to concreting, place all embedded items to be provided under this subdivision or to be furnished under other subdivisions for installation under this subdivision.
2. Give all contractors whose work is related to the concrete or must be supported by it, ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
3. Make certain that all embedded items furnished and set in forms by them are secured in position, and exercise due care not to disturb or damage their work while placing concrete.
4. Set anchor bolts for steel and equipment in accordance with setting drawings or templates which have been reviewed and found satisfactory.
5. Where holes in concrete for such purposes as recesses for railing posts, passageways for pipes, and the like are shown formed by sleeves, the contractor may, at his option, provide such holes by drilling with a acceptable diamond or tungsten carbide tipped drill bits. Fill with epoxy seal after railings are in place.

B. EMBEDDED ITEMS TO BE PROVIDED UNDER THIS SUBDIVISION

1. Dovetail anchor slots and dovetail brick anchors - DAS-G20 beehive dovetail anchor slot as manufactured by Gateway Building Products, together with DBA-G14 dovetail brick anchors. Provide masonry trades with one anchor for each 16" of anchor slot or fraction thereof plus one additional anchor for each vertical section. Place anchor slots 1'-4" on center in beams and walls where masonry abuts and one slot in each face of each column faced with masonry. Furnish anchors to space 16" on center in slots.
2. Plastic reglets for above and below grade counter flashing. Make of Type A rigid polyvinyl chloride, 0.060" thick, as manufactured by Superior Concrete Accessories, Inc. or equal.
3. Sleeves - galvanized steel pipe ASTM A 120, or plastic pipe ASTM D 2661, ASTM D 2665 or ASTM D 2852, bituminized fiber pipe conforming to ASTM D 1861 or Wilson anchor bolt sleeve.
4. Column Anchor Bolts - ASTM F 1554.Furnish with one leveling nut plus one nut and one washer.
5. Anchor Bolts – ASTM A 307.As shown on drawings.
6. Cast Iron Frames and Grates - as manufactured by Neenah Foundry Company. Castings as manufactured by Flockhart Foundry Company or McKinley Iron Works may be acceptable, provided the dimensions and design are comparable in all respects.
7. Water stops locations as shown on drawings.

3.8 VAPOR RETARDER

1. Provide sub-grade under concrete slabs-on-grade with vapor retarder consisting of polyethylene film not thinner than 10 mils, conforming to ASTM E1745, or asphalt laminated reinforced Kraft paper with polyethylene coating on both sides. Moistop as manufactured by FortiFiber Building Systems Group.
2. Provide film in width and length not less than one foot larger than dimensions of slab sub-grade unless patently impracticable. Lap edges not less than 6" and tape continuously. Take care to avoid puncturing film. Immediately prior to placing concrete, tape-seal all tears, cuts and holes.

3.9 GROUTING OF BASE PLATES

1. Nonferrous grout acceptable products are:

TYPE	MANUFACTURER
Crystex	L&M Construction Chemicals
Five Star	U.S. Grout
Sonogrout	Sonneborn
Euco N.S.	Euclid Chemical Company
Construction Grout	Master Builders
Vibroprvf #11	Lambert Corp.

2. Mix and place in conformance with printed instructions of the manufacturer.

3.10 TESTING

A. GENERAL

1. The services of an independent testing laboratory shall be retained for obtaining test specimens and performing quality control work, routine testing of materials or proposed mix designs and of resulting concrete for compliance with technical requirements of specifications.
2. Testing of field-cured test cylinders, or testing required because of changes requested by contractor in materials or proportions of the mix, as well as any extra testing of concrete or materials occasioned by failure to meet specification requirements, to be at contractor's expense.
3. Failure of the testing laboratory to detect any defective work or materials is not in any way to prevent later rejection when such defect is discovered, nor is it to obligate the owner for final acceptance.
4. The testing agency and/or its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the specifications, not to approve or accept any portion of the work, not to act as foreman or perform other duties for contractor.

B. SERVICES PROVIDED BY THE TESTING AGENCY

1. Field Sampling - Secure from different batches, on a truly random basis, composite samples for all field testing required below in accordance with ASTM C 172 where applicable. Take all samples at discharge end of conveying system. Clearly mark each test specimen master as to exact part of the structure represented, class of concrete curing conditions, temperature of concrete, and time and date of sample.
2. Compressive Strength Test - mold and cure test cylinders in accordance with ASTM C 31 and test each cylinder for strength in accordance with ASTM C 39.Take one "test set" consisting of three cylinders for each day's pour of 100 cubic yards, or fraction thereof. Test cylinders one at 7 and one 28 days, one hold.

3. Slump Tests - determine slump range for each "test set" in conformance with ASTM C 143.
4. Air Content Test - determine air content for each "test set" for air-entrained concrete in accordance with ASTM C 231.
5. Submit two copies of the results in each of the above tests and inspection to the contractor and the owner's representative and Engineer.
6. Should any of the test results fail to meet the requirements specified, make an immediate telephone report to the contractor and the owner's representative.
7. Furnish evaluation reports of compression tests as recommended by ACI 214 when any compression test fails to meet the specified strength.
8. Criteria for acceptance of concrete cylinder tests:
   a) Every arithmetic average of any consecutive three tests equals or exceed f'c, and
   b) No individual strength test (average of two cylinders) <f'c by more than 500 psi.

3.11 ACCEPTANCE OF STRUCTURE

A. GENERAL

1. Acceptance of structure will be made in conformance with ACI 301, except that contractor must pay all costs incurred for providing any additional testing or analysis required when strength of structure is considered potentially deficient.

B. CRACKS

1. The contractor will be required to restore without cost to the owner any concrete which develops cracks within a period of one year after placement which has not been caused by action of the owner or others in over stressing the concrete.
2. Repair the cracks by means that will restore the cracked members to their designed strength and appearance by acceptable methods which will not impair the appearance of the affected surfaces, if exposed, such repairs must be performed by use of suitable epoxy cements employed by an organization having satisfactorily demonstrated ability in the techniques necessary to effect such repairs, or by other acceptable methods.

END OF SECTION 03300

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SECTION 03320 - PRECAST CONCRETE U-LINTELS AND SILLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: precast concrete U-lintels and sills

B. Related Sections:
   1. Concrete Masonry Units
   2. Concrete Reinforcement
   3. Cast-in-Place Concrete

1.2 REFERENCES

A. American Society for Testing and Materials(ASTM)
   1. C33 – Specification for Concrete Aggregates
   2. C150 – Specification for Portland Cement

B. Precast/Pre-Stressed Concrete Institute (PCI) Standards: Manual for Quality Control for Precast and Pre-Stressed Concrete MNL-116.

C. American Concrete Institute: Building Code Requirements for Structural Concrete
   (ACI 318)

D. American Concrete Institute: Building Code Requirements for Masonry Structures
   (ACI 530)

1.3 SUBMITTALS

A. Provide manufacturer's catalog engineering data.

B. Manufacturer shall rate U-lintel units for gravity, uplift, and lateral loads in units of pounds per linear foot.

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1.4 QUALITY ASSURANCE

A. Fabricator's Qualifications: Units shall be fabricated by a firm engaged in the manufacturing of precast and pre-stressed concrete U-lintels and sills for a minimum of 5 years. Fabricator shall have a quality assurance program that complies with the procedures of Manual 116 by the Precast/Pre-Stressed Concrete Institute (PCI).

B. Plant records of production and quality control shall be kept in accordance with PCI recommendations and made available upon request for the Architect.

1.5 DELIVERY, STORAGE AND HANDLING

A. If storage is required prior to erection, take all necessary precautions to provide protection to prevent damage prior to installation. Maintain units free of dirt and airborne pollutants until immediately prior to erection.

B. Replace all units that are damaged due to mishandling at the job site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Materials
   1. Portland Cement: ASTM C150 Type I or III, gray color
   2. Aggregates: ASTM C33
   3. Water: Potable
   4. Admixtures: Shall not contain calcium chloride or chloride ions

2.2 FABRICATION

A. Unless specified otherwise, conform to PCI MNL-116.

B. All U-lintel units 14 feet in overall length and shorter shall be made of concrete with a minimum strength of 3500 psi at 28 days.

C. All U-lintel units exceeding 14 feet in overall length shall be made of concrete with a minimum strength of 6000 psi at 28 days and shall be pre-stressed concrete.

D. All sill units shall be made of concrete with a minimum strength of 3000 psi at 28 days.

E. All units shall be sand block finish except pre-stressed, 6" wide, and 12" wide U-lintels shall be smooth form finished.

F. Tolerances shall be per PCI MNL-116.

G. Minor patching in plant is acceptable provided structural adequacy of units is not impaired.

PART 3 - EXECUTION

3.1 FURNISHING

A. Furnish to the concrete masonry unit installer, all units that will be installed as part of the work of that section.

3.2 PROTECTION

A. Protect all stored and installed units from job site debris and impact.

B. Units damaged during storage shall be replaced if beyond repair to restore its structural adequacy.

END OF SECTION 03320

SECTION 04001 – CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 GENERAL

A. Quality Standard: See specifications on Sheets S-001 & S-002.

PART 2 - PRODUCTS

2.1 Product Standard: See specifications on Sheets S-001 & S-002.

PART 3 - EXECUTION

3.1 Execution Standard: See specifications on Sheets S-001 & S-002.

END OF SECTION 04001

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SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply this Section.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment and perform operations necessary for, and incidental to, erection of masonry work.

B. Related sections: The following sections contain requirements that relate to this section:

1. Division 3 section "Cast-in-Place Concrete"

C. Products installed but not furnished under this Section include the following:

1. Steel lintels in unit masonry are specified in Division 5 Section "Metal Fabrication".
2. Wood nailers and blocking built into unit masonry are specified in Division 6 Section "Rough Carpentry".
3. Reglets in masonry joints for metal flashing are specified in Division 7 Section Flashing and Sheet Metal".
4. Hollow metal frames in unit masonry openings are specified in Division 8 Section "Steel Doors and Frames".
5. Hollow metal frames in unit masonry openings are specified in Division 8 Section "Custom Hollow Metal Work".
6. Sealants

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):

1. f'm = 1500 psi on net area.

1.4 SUBMITTALS

A. Submit for review, manufacturers literature and/or drawings of material that is pre-fabricated or pre-assembled.

1. Product data for each different masonry unit, accessory, and other manufactured product indicated.
2. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
3. Submitted shop drawings must be checked and signed by the General Contractor.
4. Material certificates signed by manufacturer and Contractor certifying that each type of masonry unit complies with requirements specified in referenced unit masonry standard, including fire performance characteristics.
5. Hot weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
6. Results from tests and inspections performed by Owner's representatives will be reported promptly and in writing to Architect and Contractor.

1.5 QUALITY ASSURANCE

A. Unit masonry standard: ACI 530.1/ASCE 6 "Specifications for Masonry Structures".

B. Fire performance characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistances has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

C. Single source responsibility for masonry units: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from the manufacturer for each cementitious component and from one source and producer for each aggregate.

D. The contractor shall retain a qualified testing laboratory to perform the following tests:

1. Sample and test grout in accordance with ASTM C1019 for each 5000 square foot of masonry.
2. Slump tests - ASTM C143.

E. When requested by the Architect/Engineer, a qualified testing laboratory shall be retained to perform masonry prism test in accordance with ASTM E447, Method B, modified as follows:

1. Prisms shall be stack bond, one unit long and thick with a full mortar bed.
2. Limit height/thickness ratio from 1.33 - 5.00
3. Provide a minimum of one joint.

One set of three (3) prisms prior to construction and during construction for each 5000 square feet of wall.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry material to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Store cementitious materials off the ground, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Extend cover to minimum of 24 inches down both sides and hold cover securely in place.

C. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

D. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

E. Stain prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

F. Protect base of walls from rain splashed mud and mortar splatter by means of covering spread on ground and over wall surface.

G. Protect sills, ledges, and projections from mortar droppings.

H. Protect surfaces of window and door frames, as well as similar products with painted and integral finish from mortar droppings.

I. Hot weather construction: Comply with referenced unit masonry standard.

PART 2 - GENERAL

2.1 MATERIALS - GENERAL

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form of concrete masonry required.

B. Masonry Units for Fire-Rated Walls

1. Provide fire-rated units which are rated product of manufacturer listed in latest revision of building materials list, published by UL. In lieu of above rating, furnish fire resistive units on basis of examination, tests and report by nationally recognized testing agency acceptable to governing authorities and codes having jurisdiction. Report must state that units proposed to be furnished are equivalent in fire rating to those products furnished by producers in above UL building materials list.

C. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

D. Concrete masonry units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.

E. Provide Type II, non-moisture controlled units.

F. Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.

G. Hollow load-bearing concrete masonry units: ASTM C 90, Grade N and as follows:

1. Unit compressive strength: Provide units with minimum average net area compressive strength indicated below. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.
2. Use inspection and cleanout holes at bottom of wall reinforced vertical cells for grouting lifts over 5 feet high. Cleanout holes should be 3" minimum, see ACI 530.1-02, Section 3.2F. See grout space requirements for various grout pour heights in ACI 530.1-02, Section 3.5C with Table 7. See Florida Building Code page 35.1

H. Weight classification: Normal weight

2.3 MORTAR AND GROUT MATERIALS

A. Mortar - Type S

B. Grout - 2500 psi at 28 days

C. Portland cement: ASTM C 150, Type I or II. Provide natural color.

D. Ready-mixed mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article, combined with set controlling admixtures to produce a ready-mixed mortar complying with ASTM C 270.

E. Hydrated lime: ASTM C 207, Type S.

F. Aggregate for mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.

G. Aggregate for grout: ASTM C 404.

H. Water: Clean and potable.

2.4 REINFORCING STEEL

A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article, formed from the following:

1. Galvanized carbon steel wire, coating class as required by referenced unit masonry standard for application indicated.

B. Description: Welded wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner an tee units, and complying with requirements indicated below:

1. Wire diameter for side rods: 0.1483 inch (9 gage).

C. For single wythe masonry provide type as follows with single pair of side rods:

1. Ladder design with perpendicular cross rods spaced not more than 16 inches O.C.

D. For multi-wythe masonry provide type as follows:

1. Ladder design with perpendicular cross spaced not more than 16 inches O.C.
2. Number of side rods for multi wythe concrete masonry: One side rod for each face shell of hollow masonry units more than 4 inches or less in nominal width.

E. Tab design with single pair of side rods and rectangular box-type cross ties spaced not more than 16 inches O.C., with side rods spaced for embedment within each face shell of backup wythe and ties extended to engage the outer wythe by at least 1-1/2" inches.

F. Use units with adjustable two piece rectangular ties where horizontal joints of facing wythe do not align with those of backup by more than and where indicated.

G. Available manufacturers: Subject to compliance with requirements, manufacturers offering joint reinforcement that may be incorporated in the work include, but are not limited to, the following:

1. AA Wire Products/Hohmann & Barnard, Inc.
2. Dur-O-Wal, Inc.
3. Masonry Reinforcing Corporation of America

2.5 TIES AND ANCHORS

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of reference unit masonry standard and this article.

B. Galvanized carbon steel wire: ASTM A 82, coating class as required by referenced unit masonry standard for application indicated.

C. Wire diameter: 0.1875 inch.

D. Galvanized heavy thickness steel sheet: ASTM A 635 (commercial quality) hot-rolled carbon steel sheet hot-dip galvanized after fabrication to comply with ASTM A 525, Class B3, for rigid anchors fabricated from steel sheet or strip with a thickness of 0.180 inch and greater.

E. Steel plates and bars: ASTM A 36, hot dipped galvanized to comply with ASTM A 123 or ASTM A 153, Class B3, as applicable to size and form indicated.

F. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

1. Dur-O-Wal, Inc.
2. Heckman Building Products, Inc.
3. Hohmann & Barnard, Inc.

2.6 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie shape for hollow masonry units laid with cells vertical: Rectangular with closed ends and not less than 4 inches wide.

B. Type for masonry where coursing between wythes align: Unit ties bent from one piece of wire.

C. Type for masonry where coursing between wythes does not align: Adjustable ties composed of two parts, one with pintles, the other with eyes, maximum misalignment 1-1/4 inches.

2.7 ADJUSTABLE ANCHORS FOR CONNECTING MASONRY TO STRUCTURAL WORK

A. General: Two piece assemblies as described below allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it.

B. For anchorage to concrete framework, provide manufacturer's standard with dovetail anchor section formed from sheet metal and triangular shaped wire ties section seized to extend within 1 inch of masonry face and as follows:

1. Wire diameter: 0.1875 inch

2.8 MISCELLANEOUS ANCHORS

A. Unit type masonry inserts in concrete: Cast iron or malleable iron inserts of type and sized indicated.

B. Dovetail slots: Furnished dovetail slots, with filler strips, or slot size indicated, fabricated from 0.0336 inch (22 gage) sheet metal.

2.9 POST-INSTALLED ANCHORS

A. Anchors as described below, with capacity to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Type: Chemical anchors
2. Type: Expansion anchors

B. Corrosion protection: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

C. For cast-in-place and post-installed anchors in concrete: Capability to sustain, without failure, a load equal to 4 times loads imposed by masonry.

D. For post-installed anchors in grouted concrete masonry units: Capability to sustain, without failure, a load equal to 6 times loads imposed by masonry.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Non-metallic expansion joint strips: Pre-molded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:

1. Neoprene
2. Urethane
3. Polyvinyl chloride

B. Pre-formed control joint gaskets: Materials as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene rubber compound: ASTM D 2000, Designation 2AA-805
2. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406

C. Bond breaker strips: Asphalt saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.11 MASONRY CLEANERS

A. Job mixed detergent solution: Solution of trisodium phosphate (1/2 cup dry measure) dissolved in one gallon of water.

B. Job mixed muriatic solution: Solution of 1 part muriatic acid and 10 parts clean water, mixed in a non-metallic container with acid added to water.

C. Proprietary acidic cleaner: Manufacturer's standard strength, general purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.

D. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface acting acids, cheating, and wetting agents.

E. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.

F. Available products: Subject to compliance with requirements, a product that may be used to clean until masonry surfaces includes, but is not limited to, the following:

1. "Sure Klean No. 600 Detergent", ProSoCo, Inc.
2. "Sure Klean No. 101 Lime Solvent", ProSoCo, Inc.
3. "Sure Klean Vana Trol", ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, antifreeze compounds, or admixtures, unless otherwise indicated.
B. Do not use calcium chloride in mortar or grout.

C. Procedures of ASTM C780 is to be used to test and evaluate mortar and establish pre-construction datum and quality control testing for types of mortar indicated below:

1. Type S

D. Grout for unit masonry: Comply with ASTM C 476 and referenced unit masonry standard.

2.13 SOURCE QUALITY CONTROL

A. Concrete masonry unit tests: For each type, class, and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140, if required by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. Mix mortar and grout in power driven, drum type mixers. Operate mixer a minimum of 5 minutes after addition of all materials.

B. Comply with referenced unit masonry standard and other masonry construction to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

C. Build chases and recesses as shown or required to accommodate items specified in this and other sections of the specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses. Coordinate masonry with all adjacent work of other trades.

D. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

E. Cut masonry units with motor driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining constructions. Use full size units without cutting where possible.

F. Matching existing masonry: Where applicable, match coursing, bonding, color, and texture of new masonry with existing masonry.

G. Do not use masonry units with chips, cracks, voids, discolorations or other defects.

3.3 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of ACI 530 or N.C.M.A.

3.4 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond pattern for exposed masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

1. One half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bounded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

E. Stopping and resuming work: In each course, rack back 1/2 unit length for one-half running bond or 1/3 unit length for one -third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

F. Re-temper mortar as necessary to keep plastic. Use no mortar after setting has begun or after 2 1/2 hours of initial mixing.

G. Built-in work: As construction progresses, built-in items specified under this and other sections of the specifications. Fill in solidly with masonry around built-in items.

H. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

I. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

J. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

K. Reinforced vertical concrete blocks cells, grouting solid where indicated on plan.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows: With full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

3.6 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch of exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bed reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

D. Provide horizontal joint reinforcement at doors and windows for first and second block course above and below apertures. Run reinforcing continuous or extend two feet from aperture edge.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 26 inches o.c. horizontally.

3.8 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond breaker strips on in ends of block units on one side of control joint. Fill the joint with mortar and rake joints in exposed faces.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide reinforced precast concrete lintels. Cure precast lintels before handling and installation.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements or referenced unit masonry standard.

B. Temporary formwork: Construct formwork and shores to support reinforced masonry elements during construction. Contractor is completely responsible for the proper design and construction of all temporary forms and bracing.

C. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

D. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

E. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet all surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean concrete masonry by means of cleaning method indicated in N.C.M.A. TEK 45 applicable to type of stain present on exposed surfaces.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of substantial completion.

END OF SECTION 04200

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All requirements of the general provisions of the contract including General and Supplementary Conditions, Division 0 and Division 1 forms a part of this section.

1.2 DESCRIPTION

A. SCOPE OF WORK

1. This Section includes fabrication, delivery, unload and store in locations directed and erect all structural steel work, as shown on drawings and specified, including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

B. Related work not specified under this subdivision:

1. Steel joist
2. Setting of anchor bolts, cast in concrete, or masonry.
3. Metal fabrications.

1.3 SUBMITTALS

A. Submit for review, complete shop drawings covering fabrication and erection of all work under this subdivision, including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

B. Submitted shop drawings must be checked and signed by the General Contractor.

C. Test reports conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.4 QUALITY ASSURANCE

A. Codes and standards: Comply with applicable provisions of the latest issue of the following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges" - except paragraph 4.2.1. AISC "Specification for Structural Steel Buildings", including "Commentary".
2. "Specifications and Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
3. Structural Welding Code (AWS D1.1)
4. Steel Structures Painting Council (SSPC)

B. Qualifications for welding work: Qualify welding procedures and welding operations in accordance with AWS "Qualification" requirements.

C. Welders to have current certificates, If re-certification of welders is required, re-testing will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress or work. Store on site only in authorized locations.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground. Protect steel members and packaged materials from exposure to the weather.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Misc. structural shapes, plates, etc...: ASTM A 36

B. Structural beams, columns, etc...: ASTM A36 or ASTM A992 GR.50 - Refer to structural drawings.

C. Hot-formed steel tubing: ASTM A 501

D. Steel pipe: ASTM A53, Type E or S, Grade B; or ASTM A501

E. Anchor bolts: ASTM A 307, non-headed type, with nuts and washers.

F. Unfinished threaded fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts, nuts, and washers. Provide hexagonal heads.

G. High strength threaded fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, complying with ASTM A325.

H. Electrodes for welding: Comply with AWS Code. Use E70XX electrodes.

I. Grout: non-shrink, non-metallic, flowable or plastic with minimum of 7,000 psi at 28 days in accordance with CRD-C 621, Army Corps of Engineers.

2.2 FABRICATION

A. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Properly mark-match materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

B. Work shall be executed by skilled workmen under experienced supervision.

C. Connections: Weld or bolt shop connections.

D. Bolt field connections with high-strength bolts, except where welded connections are indicated.

E. Field verify all existing dimensions and elevations prior to fabrication.

F. High strength bolted construction: Install high strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A 325 Bolts". Use bearing type bolts with threads included in shear plane.

G. Welded construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welding work.

H. Holes for other work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

2.3 SHOP PAINTING

A. General: Shop paint all structural steel, except anchor bolts and surfaces to be field welded.

B. Paint all members after fabrication, except where surfaces would be inaccessible for surface prep and painting.

C. Apply paint in sufficient volume or coats to provide a minimum dry film thickness of 3 but not more than 5 mils.

D. Surface preparation: Clean steel in accordance with Steel Structures Painting Council (SSPC - SP3 Power Tool Cleaning).

2.4 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspections at tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Promptly remove and replace materials or fabricated components that do not comply.

PART 3 - XECUTION

3.1 ERECTION

A. Must conform to the applicable provisions of AISC specifications.

B. Temporary planking: Provide temporary planking and working platforms as necessary to effectively complete work.

C. Setting bases and bearing plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

D. All anchor bolts shall be built into connections work in advance.

E. Set loose and attached base plates and bearing plates for structural members on leveling nuts. Do not use wedges of shims.

F. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding cut off flush with edge of base or bearing plate prior to packing with grout.

G. Field assembly: Set structural frame accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

H. All bolts, including anchor bolts, shall have enough projection to expose not less than 1-1/2 threads after nuts is tightened. Level and plumb individual members of structure within specified AISC tolerances.

I. If steel is damaged or does not fit-up, Contractor shall submit proposed corrective measures for review by Engineer.

J. Do not enlarge unfair holes in members by burning or by using drift pins. Drill or ream holes that must be enlarged to accommodate next larger fastener, where possible.

K. The use of a gas cutting torch in field for correcting fabrication errors in primary structural members will not be permitted.

L. Immediately after erection, clean field welds, bolted connections, and abraded areas where shop coat was damaged. Spot and prime areas using same material as used for shop coat.

M. Set all members so that, in their final location, level, plumbness and alignment are within the tolerances prescribed by AISC Code.

3.2 QUALITY CONTROL

A. An independent testing and inspection agency shall be retained to inspect structural steel members high strength bolted connections and welded connections.

B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom. Submit 3 copies of each report to Owner's representative.

C. Provide access for testing agency to places where structural steel work is begin fabricated or produced so that required inspection and testing can be accomplished.

D. Minimum required testing:

1. Visually inspect all structural steel beams, columns, etc.
2. Visually inspect all bolted and welded connections.
3. Test all beam or column splices.
4. Test a representative sample of all full or partial penetration welds.

E. Correct deficiencies in structural steel work that inspections have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expenses, as necessary to reconfirm any non-compliance of original work and to show compliance of corrected work.

3.3 FINAL CLEANUP

A. All temporary guys, braces, falswork, cribbing, rubbish and other debris are to be removed upon completion of erection.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to work of this Section.

1.2 SCOPE OF WORK

A. Provide all equipment, labor and perform all work as necessary to fabricate, furnish, deliver, unload, store in locations directed and erect on supports to be provided under another subdivision all open-web steel joists and accessories as specified herein and as indicated.

B. Related work not specified under this subdivision:

1. Structural Steel
2. Steel and ironwork of a miscellaneous nature
3. Setting anchor bolts
4. Grouting bearing plates

1.3 QUALITY ASSURANCE

A. Provide joists fabricated in compliance with the following, as herein specified.

B. Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Table" for:

1. K-Series open web steel joists

C. Joist fabricator shall be a member of the Steel Joist Institute.

D. American Institute of Steel Construction (AISC)

E. American Welding Society (AWS)

F. Steel Structures Painting Council (SSPC)

G. Qualification of field welding: Qualify welding processes and welding operators in accordance with American Welding Society "Structural Welding Code", AWS D1.1

H. See Structural Steel 05120, 3.02 for testing requirements.

1.4 SUBMITTALS

A. Submit for review complete shop drawings covering, fabrication of all work under this subdivision including erection of such work on supports furnished under a separate subdivision.

B. Submitted shop drawings and calculations signed, sealed and dated by the Specialty Professional Engineer who is a Florida licensed Engineer in the structural discipline.

C. Design techniques, type, and format of supporting calculations, and all submittals must be reviewed by the Engineer-of-Record.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Joist shall be inspected by the manufacturer before shipment to insure compliance of materials and workmanship.

B. Deliver, unload, store in locations directed, and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chord members: 50 ksi yield

B. Web members: 36 ksi or 50 ksi yield

C. If requested by owner's representative, evidence that the steel meets design yield strength shall be provided in the form of certified test reports.

D. Bearing plates ASTM A36.

E. High strength bolts ASTM A325.

F. Steel prime paint:

1. Steel Structures Painting Council specification 15-68T, Type I. Asphalt paint shall not be used.

2.2 FABRICATIONS

A. General: The design and manufacture of steel joists shall conform to the latest standard specifications and load tables for open web steel joists, as adopted by the Steel Joist Institute.

B. Holes in chord members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area holes from the area of chord when calculating strength member.

C. Extend ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specification" and load tables.

D. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications".

E. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

F. Splices: May occur at any point in the chord members and shall be butt welded splices developing 100% of the cross sectional area of the member splices, and shall develop a minimum tensile strength of 57,000 psi on the full cross sectional area.

G. Deflection: Live load deflections shall not exceed: 1/240 of span for roofs and 1/360 of span for floors.

H. Camber: See SJI specifications for required camber.

I. Shop painting: Prior to shipping, all joists shall be cleaned of rust and mill scale by brushing with steel bristle brushes and shall have one shop coat of paint meeting Steel Structures Painting Council Specification (SSPC) 15-68T, Type I, gray applied by either dipping and/or spraying. Shop coat of paint shall be 1 mil minimum.

PART 3 - EXECUTION

3.1 ERECTION

A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Anchors: Furnish anchor bolts, bearing plates, and other devices to be built into concrete and masonry construction.

C. Refer to Division 4 sections for installation of anchors set in masonry.

D. Placing joist: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

E. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.

F. Where "open web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

G. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

H. Uplift: See plan for net wind load uplifts on roofs. Steel joist bottom chords must safely resist the wind uplift. A single line of bottom chord bridging must be provided at the first panel point from each support.

I. Temporary bracing: Contractor shall provide any temporary bracing required to adequately distribute erection loads so that the carrying capacity of any individual joist is not exceeded.

J. Field weld or bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.

K. Damaged joists: Shall be replaced at no additional cost to Owner.

L. Touch-up painting: After joist installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

M. Do not permit any application of construction loads to joists unless all joists are fastened in place and permanent bridging installed.

N. Fasten joist and joist girders to structural steel at column lines by bolting per SJI standard specification provisions.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.

1.2 DESCRIPTION

A. SCOPE OF WORK

1. This section includes fabrication, delivery, unload and store in locations directed and erect all roof deck units as shown on drawings and specified.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification section.

B. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.

C. Shop drawings showing layout and type of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

D. Submitted shop drawings must be checked and signed by the General Contractor.

E. Welder certificate: See Section 05120 for certification submittal requirement.

1.4 QUALITY ASSURANCE

A. Codes and standards: Comply with provisions of the following Codes and Standards, except as otherwise indicated:

1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members".

2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel".
3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks".

B. Qualification of field welding: Use qualified welding processes and welding operators in accordance with "Welder Qualifications" procedures of AWS. Welded decking in place is subject to inspection and testing.

C. FM listing: Provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire-rated construction.

D. See Structural Steel 05120, 3.02 for testing requirements.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Roof deck to be 1-1/2 inch deep, 22 gauge, wide rib (Type B) with galvanized finish. Minimum properties are as follows. Computation of properties shall reflect the "Effective Compress Flange Width" concept.

22 Gauge
I = 0.169 in.^ (4)
S_p = 0.189 in.^ (3)
S_n = 0.192 in.^ (3)

Maximum live load deflection = l/240 of span.
Maximum working stress = 20 ksi

B. Floor deck to be 9/16 inches deep, 26 gauge, galvanized permanent form deck. Minimum properties are as follows:

26 Gauge
I = 0.015 in.^ (4)
S_p = 0.043 in.^ (3)
S_n = 0.043 in.^ (3)

2.2 MANUFACTURERS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:

1. Marlyn Steel Products, Inc.
2. Vulcraft Div., Nucor Corporation

2.3 MATERIALS

A. Steel for galvanized metal deck units: A653 Grade 33 with coating designation G90.

B. Miscellaneous steel shapes: ASTM A 36.

C. Sheet metal accessories: ASTM A 924, galvanized, G90.

D. Galvanizing repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

E. Flexible closure strips: Manufacturer's standard mineral fiber closures.

F. Metal deck and sheet metal coating designation:

1. With structural concrete or insulating concrete topping – G90
2. Without structural concrete or insulating concrete topping – G60

2.4 FABRICATION

A. General: Form deck units in lengths to span three or more supports, with flush, telescoped, or nested 2 inch laps at ends and interlocking or nested side laps, of metal thickness, depth, and width as indicated.

B. Roof deck units: Provide deck configurations that comply with SDI “Specification and Commentary for Steel Roof Deck".

C. Roof sump pans: Fabricate from single piece of 0.071 inch min. (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to draining. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below roof deck surfaces unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

PART 3 - EXECUTION

3.1 GENERAL

A. Delivery and storage: Deliver deck to job site in bundles and store off ground with one end elevated for water drainage. Cover with waterproof covering, ventilated to avoid condensation.

3.2 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.

B. Place deck units on supporting steel framework and adjust to final position with end accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

C. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or deflection.

E. Suspended ceiling, light fixtures, ductwork, piling or other utilities shall not be suspended from decking.

F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

G. Fasten roof deck to supporting steel by welding. See drawings for weld pattern.

H. Comply with AWS requirements and procedures for manual shielded metal arc weld, appearance and quality of welds, and methods used in correcting welded work. Minimum puddle welded size = 5/8 inch diameter.

I. Use care in selecting electrodes and amperage to provide positive weld and to prevent blow-out holes.

J. Use welding washers for all decking 24 gage or thinner.

K. Mechanically fasten side laps of adjacent deck units between supports with No. 10 self-tapping machine screws.

L. Uplift loading: Install and anchor roof deck units to resist gross uplift loading. See plan for uplift loading requirements.

M. Cutting and fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

N. Reinforcement at openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

O. Roof sump pans: Place over openings provided in roof decking and weld to top decking surface. Space weld not more than 12 inches o.c. with at least one weld at each corner. Detail on architectural drawings.

P. Closure strips: Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.

Q. Touch-up painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

R. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

END OF SECTION 05310

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SECTION 055000 - METAL FABRICATIONS

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. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for operable partitions.
3. Steel framing and supports for countertops.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Steel girders.
7. Steel pipe.
8. Prefabricated building columns.
9. Shelf angles.
10. Loose bearing and leveling plates.
11. Steel weld plates and angles for casting into concrete not specified in other Sections.
12. Metal bollards.
13. Metal downspout boots.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place/Miscellaneous Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 4 Section "Concrete Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 5 Section "Structural Steel."

4. Division 6 Section "Rough Carpentry/Miscellaneous Carpentry" for metal framing anchors.
5. Division 10 Section "Wire Mesh Partitions."

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials 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.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Prefabricated building columns.
3. Metal nosings and treads.
4. Paint products.
5. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type and finish of extruded [nosing] [and] [tread].

D. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

E. Welding certificates.

F. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type [304] [316L].

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type [304] [316L].

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type [304] [316] stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group [1 (A1)] [2 (A4)].

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group [1 (A1)] [2 (A4)] stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

   1. Use primer with a VOC content of [420 g/L (3.5 lb/gal.)] <Insert VOC limit> or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Provide bearing plates welded to beams where indicated.
2. Drill girders and plates for field-bolted connections where indicated.
3. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches (600 mm) o.c.

E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness, unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
2. Unless otherwise indicated, provide 1/2-inch (12.7-mm) baseplates with four 5/8-inch (16-mm) anchor bolts and 1/4-inch (6.4-mm) top plates.

F. Galvanize miscellaneous framing and supports where indicated.

G. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.8 PREFABRICATED BUILDING COLUMNS

A. General: Provide prefabricated building columns consisting of load-bearing structural-steel members protected by insulating concrete fireproofing encased in an outer non-load-bearing steel shell.

2.9 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.10 MOVING PARTITION WALL SUPPORT

A. Fabricate moving wall partition support and bracing from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch (16-by-38-mm) steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches (250 mm) o.c. Reinforce track and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securingrtack into structural steel and/or adjoining steel bar joists.

B. Extend bottom of bracing to elevation indicated with steel angle clips welded to frames for anchoring frame to roof with expansion shields and bolts.

C. Prime interior steel frames, where required with zinc-rich primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. 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 surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted base plates. Position and grout column base plates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout base plates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC's "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary" and with requirements applicable to listing and labeling for fire-resistance rating indicated.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, 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.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

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SECTION 06105 - MISCELLANEOUS ROUGH CARPENTRY

1.1 MATERIALS

A. Wood Products, General:

1. Lumber and Plywood: FSC-certified desired.
2. Maximum Moisture Content of Lumber: 15 percent.

B. Wood-Preservative-Treated Materials:

1. Preservative Treatment: AWPA U1; use Category UC2 .

   a. Preservative Chemicals: Containing no arsenic or chromium.

2. Application: All miscellaneous carpentry and the following:

   a. Items in contact with roofing or waterproofing.
   b. Items in contact with concrete or masonry.
   c. Framing less than 18 inches (460 mm) above ground in crawlspaces.
   d. Floor plates installed over concrete slabs-on-grade.

C. Fire-Retardant-Treated Materials:

1. Interior Type A unless otherwise indicated.
2. Application: Items indicated and the following:

   a. Framing for raised platforms.
   b. Concealed blocking.
   c. Roof framing and blocking.
   d. Items in contact with roofing.
   e. Plywood backing panels.

D. Dimension Lumber Framing:

1. Non-Load-Bearing Interior Partitions: Not Allowed.
2. Other Framing: No. 2 Construction, Stud grade southern pine, Douglas fir-larch or mixed southern pine.

E. Miscellaneous Lumber:

1. Dimension Lumber: No. 2 Construction, Stud grade southern pine, Douglas fir-larch or mixed southern pine.

2. Utility Shelving: 15 percent maximum moisture content.

   a. White, lodgepole, ponderosa, or sugar pine; Premium .

b. Mixed southern pine, No. 2 or better.
c. Hem-fir, Select Merchantable or No. 1 Common.
d. Spruce-pine-fir, [Select Merchantable or No. 1 Common.

3. Concealed Boards: 15 percent maximum moisture content.

a. Mixed southern pine, No. 2.
b. Hem-fir, Construction or No. 2 Common.
c. Spruce-pine-fir, Construction or 2 Common.
d. Eastern softwoods, No. 2 Common.
e. Northern species, No. 3 Common.
f. Western woods, Construction or No. 2 Common .

F. Fasteners: Stainless steel where exposed to weather, in ground contact, in contact with treated wood, or in area of high relative humidity.

1.2 INSTALLATION

A. Furring to Receive Plywood or Hardboard Paneling: 1-by-3-inch nominal-size (19-by-63-mm actual-size) furring at 24 inches o.c.

B. Furring to Receive Gypsum Board: 1-by-2-inch nominal-size (19-by-38-mm actual-size) furring at 16 inches o.c.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, [mark grade stamp on end or back of each piece] [or] [omit grade stamp and provide certificates of grade compliance issued by grading agency].
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2, 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 containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry, unless otherwise indicated:

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 and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and] AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat all miscellaneous carpentry, unless otherwise indicated.] [items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Roof construction.

4. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Miscellaneous Framing: No. 2 Construction grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 INTERIOR WOOD TRIM

A. General: Provide kiln-dried finished (surfaced) material without finger-jointing, unless otherwise indicated.

B. Hardwood Lumber Trim for Transparent (Stain or Clear) Finish: Clear red oak selected for compatible grain and color.

C. Lumber Trim for Opaque (Painted) Finish: Either finger-jointed or solid lumber, of[one of] the following species and grades:

1. Grade D Select Finish eastern white pine; NeLMA or NLGA.
2. Grade D Select Quality Idaho white, lodgepole, ponderosa, or sugar pine; NLGA or WWPA.

D. Moldings: Made to patterns included in WMMPA WM 7 and graded according to WMMPA WM 4.

1. Moldings for Transparent (Stain or Clear) Finish: N-grade eastern white, Idaho white, lodgepole, ponderosa, or sugar pine.
2. Moldings for Opaque (Painted) Finish: P-grade eastern white, Idaho white, lodgepole, ponderosa, or sugar pine.

2.7 SHELVING AND CLOTHES RODS

A. Shelving: Made from one of the following materials, 3/4-inch (19-mm) thick.
1. Particleboard with solid-wood front edge.
2. Wood boards of same species and grade indicated above for interior lumber trim for opaque finish.

B. Shelf Cleats: 3/4-by-5-1/2-inch (19-by-140-mm) boards with hole and notch to receive clothes rods, of same species and grade indicated above for interior lumber trim for opaque finish.

2.8 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.9 FASTENERS

A. General: Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit 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. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports, unless otherwise indicated.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

E. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

F. Wood Trim Installation: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint-finishing operations are completed.

3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.6-mm) maximum offset for reveal installation.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06105

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SECTION 06192 - PREFABRICATED METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

1.2 DESCRIPTION

A. SCOPE OF WORK

1. Provide all labor, materials, equipment and services for fabrication, delivery, unload and store in locations directed and erect all wood trusses shown and specified to include the following:
   a. Gable-shaped trusses.
   b. Hip and girder trusses at hip ends of roof.
   c. Scissors trusses.
   d. Monopitch trusses.
   e. Parallel chord 4 x 2 wood trusses.
   f. Piggy back trusses.

B. Related work not specified under this subdivision:
1. Roof sheathing is specified in Division 6 Section "Rough Carpentry" or on the structural drawings.
2. Setting anchor bolts, cast-in-concrete or masonry.
3. Pressure treated lumber.

1.3 DEFINITIONS

A. Prefabricated metal-plate-connected wood trusses include planar structural units consisting of metal-plate-connected members that are fabricated from dimension lumber and that have been cut and assembled prior to delivery to the project site.

1.4 QUALITY ASSURANCE

A. Applicable Publication
1. Western Wood Products Association Publication: *Standard Grading Rules For Western Lumber.*

2. National Forest Products Association Publication: *National Design Specification for Stress Graded Lumber and its Fastenings*
3. West Coast Lumber Inspection Bureau Standards: *Standard Grading and Dressing Rules for Douglas Fir, West Coast Hemlock, Sitka Spruce, White Fir, and Western Red Cedar Lumber, No. 16*
4. Southern Pine Inspection Bureau: *Standard Grading Rules for Southern Pine Lumber*
5. Southern Forest Products Association.

B. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. "Design Specification for Metal Plate Connected Wood Trusses."
2. "Design Specification for Metal Plate Connected Parallel Chord Wood Trusses."
3. "Commentary and Recommendations for Handling and Erecting Wood Trusses."
4. "Commentary and Recommendations for Bracing Wood Trusses."
5. "Quality Standard for Metal Plate Connected Wood Trusses."

C. Connector Plate Manufacturer's Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality control procedures for manufacture of connector plates published in TPI "Quality Standard for Metal Connector Plate Manufacture."

D. Wood Structural Design Standard: Comply with applicable requirements of N.F.P.A. "National Design Specification for Wood Construction."

E. Single-Source Engineering Responsibility: Provide trusses engineered by the metal plate connector manufacturer to support superimposed dead and live loads indicated, with design approved and certified by a qualified professional engineer.

F. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal-plate-connected wood trusses similar to those of this Project and with a record of successful in-service performance.

G. Fabricator's Qualifications: A firm that complies with the following requirements for quality control and is experienced in prefabricating metal-plate-connected wood trusses similar to those of this Project that have a record of successful in-service performance:
1. Fabricator participates in a recognized quality assurance program that involves inspection by SPIB; Timber Products Inspection, Inc.; Truss Plate Institute; or other independent inspection and testing agency acceptable to Architect and authorities having jurisdiction.

H. Single Source Responsibility for Connector Plates: Provide metal connector plates from a single manufacturer.

1.5 SUBMITTALS

A. Product data for lumber, metal connector plates, hardware, fabrication process, and fasteners.

B. Shop drawings indicating species, species group, sizes, and stress grades of lumber to be used; pitch, span, camber, configuration, and spacing for each type of truss required; type, size, material, finish, design values, and location of metal connector plates; and bearing details.

1. To the extent engineering design considerations are indicated as fabricator's responsibility, include design analysis indicating loading, assumed allowable stress, stress diagrams and calculations, shop drawings and other information needed for review that have been signed and sealed by a qualified professional engineer responsible for their preparation.

C. Product certificate, signed by officer of fabricating firm, certifying that metal-plate-connected wood trusses supplied for Project comply with specified requirements.

D. Submitted shop drawings must be checked and signed by the General Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses with care and comply with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning, or other cause which trusses are not designed to resist or endure.

1.7 SEQUENCING AND SCHEDULING

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 CONNECTOR PLATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connector plates that may be incorporated in the Work include, but are not limited to, the following:

1. Simpson Strong-Tie Connectors
2. Hughes Manufacturing.
3. Alpine Engineered Products, Inc.
4. Bemax of Florida, Inc.

2.2 LUMBER

A. Factory mark each piece of lumber with type, grade, mill, and grading agency.

B. Lumber Standard: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

1. SPIB - Southern Pine Inspection Bureau.

C. Nominal sizes are indicated, except as shown by detail dimensions.

D. Provide dressed lumber, S4S, manufactured to actual sizes required by PS 20 to comply with requirements indicated below:

1. Moisture Content: Seasoned, with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
2. Any species and grade that complies with the following requirements for species group as defined in Table 8.1a of N.F.P.A National Design Specification, for extreme fiber stress in bending "Fb" for single and repetitive members, and for modulus of elasticity "E":
   a. Group II species, "Fb" of 1200 psi for single member use and of 1400 psi for repetitive member use, and "E" of 1,600,000 psi.

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates from metal complying with requirements indicated in this article.

B. Electrolytic Zinc-Coated Steel Sheet: Structural (physical quality steel sheet complying with ASTM A 591, Coating Class C, and, for structural properties, with ASTM A 446, Grade A; zinc coated by electro-deposition; with minimum coated metal thickness indicated but not less than 0.047 inch.

C. Hot-Dip Galvanized Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 446, Grade A; zinc coated by hot-dip process to comply with ASTM A 653, Designation G60; minimum coated metal thickness indicated but not less than 0.036 inch.

D. Exterior Coastal Areas: Stainless steel, Type 316L.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. With galvanized connector plates, provide fasteners with a hot-dip zinc coating per ASTM A 653.
2. With stainless steel connector plates, provide fasteners per AISI Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power Driven Fasteners: National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.5 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which reports exist from a model code organization acceptable to authorities having jurisdiction that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 653 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

2.6 FABRICATION

A. Fabricate metal connector plates to size, configuration, thickness, and anchorage details required to withstand design loadings for types of joint designs indicated.

B. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with full-bearing joints closely fitted, particularly at peak heel joints, to comply with tolerances specified in TPI "Quality Standard for Metal Plate Connected Wood Trusses." Position members to produce design camber indicated.

C. Connect truss members by means of metal connector plates accurately located and securely fastened to each side of wood members by means indicated or approved.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Erect and brace trusses to comply with applicable requirements of referenced TPI standards.

B. Where trusses do not fit, return them to fabricator and replace with trusses of correct size; do not alter trusses in the field.

C. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

D. Joist trusses in place by means of lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

G. Do not cut or remove truss members.

END OF SECTION 06192

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SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Concealed building insulation.
2. Radiant barriers.
3. Sound attenuation insulation.

1.2 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product test reports.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

A. Retain ASTM test method below based on product and kind of fire-resistance characteristic specified for each product in Part 2. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Manufacturers:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Where glass-fiber blanket insulation is indicated, provide blankets in batt or roll form.

2.4 RADIANT BARRIERS

A. Sheet Radiant Barriers: ASTM C 1313 and as follows:

1. Products:

a. Innovative Energy, Inc.; R+Heatshield Commercial Solid.
b. Innovative Insulation, Inc.; Super R Premium (Commercial).

2. Sheet Construction: Foil on both sides of substrate.
3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 5 and 10, respectively.

2.5 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, 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. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 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. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
   1. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

3.3 INSTALLATION OF RADIANT BARRIERS

A. Install sheet radiant barriers in locations indicated according to ASTM C 1158.

END OF SECTION 07210

FOAMULAR® INSULPINK®–Z

Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Energy-Saving, Moisture-Resistant XPS Insulation

Insulation for Z-Furring Channels

ASTM C578 Type X, 15 psi minimum

Description

INSULPINK®-Z insulation is extremely lightweight for easy handling and provides a compressive strength of 15 psi, which meets the requirements of a vertical wall application. INSULPINK®-Z insulation provides an R-value of 5 per inch of product thickness, and outstanding resistance to moisture for long-term retention of the thermal performance. INSULPINK®-Z insulation is produced by Owens Corning's patented HYDROVAC® process technology under conditions of strict quality control.

Key Features

- Helps reduce job site labor costs while you install premium insulation
- INSULPINK®-Z insulation is pre-cut to a nominal width of 23⅞" x 96" length panels, eliminating costly cutting of insulation panels to fit 24" o.c. Z-channels
- Available in a thickness of 1½" and 2" with square edges
- Excellent long-term stable insulating performance with an R-value of R-5[1] per inch
- Exceptional moisture resistance, long-term durability
- Limited lifetime warranty[2]—maintains 90% of R-value and covers all ASTM C578 properties
- The only XPS foam to be GREENGUARD Children & Schools Certified℠
- The only XPS foam with certified recycled content—certified by SCS Global Services to contain a minimum 20% recycled content
- Will not corrode, rot or support mold growth
- Zero ozone depletion potential with 70% less global warming potential than our previous formula
- Reusable
- Lightweight, durable rigid foam panels are easy to handle and install
- Easy to saw, cut or score

Technical Information

This product is combustible. A protective barrier or thermal barrier is required as specified in the appropriate building code. For additional information, consult MSDS or contact Owens Corning World Headquarters at 1-800-GET-PINK®.

All construction should be evaluated for the necessity to provide vapor retarders. See current ASHRAE Handbook of Fundamentals.

FOAMULAR® XPS insulation is a non-structural material and must be installed on framing which is independently braced and structurally adequate to meet required construction and service loading conditions.

FOAMULAR® insulation can be exposed to the exterior during normal construction cycles. During that time some fading of color may begin due to UV exposure, and, if exposed for extended periods of time, some degradation or "dusting" of the polystyrene surface may begin. It is best if the product is covered within 60 days to minimize degradation. Once covered, the deterioration stops, and damage is limited to the thin top surface layers of cells. Cells below are generally unharmed and still useful insulation.

Standards, Codes Compliance

- Meets ASTM C 578 Type X
- UL Classified. A copy of UL Classification Certificate U-197 is available at www.foamular.com
- See UL ER8811-01 at UL.com
- See www.foamular.com for details on listings, constructions and assemblies

FOAMULAR® INSULPINK®–Z
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

- Meets California Quality Standards and HUD UM #71A
- Compliance verification by RADCO (AA-650)

Certifications and Sustainable Features of FOAMULAR® XPS insulation

- FOAMULAR® XPS insulation is reusable
- FOAMULAR® XPS insulation is made with a zero ozone depletion formula
- Certified by SCS Global Services to contain a minimum of 20% recycled content
- Certified to meet indoor air quality standards under the stringent GREENGUARD Certification Program, and GREENGUARD Gold Certification Program
- Approved under the Home Innovation Research Labs NGBS Green Certification Program
- Utilizing FOAMULAR® XPS insulation can help achieve green building certifications including the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) certification
- FOAMULAR® XPS insulation may qualify for The Buy American provision of the American Recovery and Reinvestment Act (ARRA)

Typical Physical Properties[1]

FOAMULAR® INSULPINK®–Z XPS Insulation

Property	Test Method[2]	Value
Thermal Resistance [3], R-Value (180 day) minimum, hr•ft^2•°F/Btu (RSI, °C•m^2/W)		
@ 75°F (24°C) mean temperature	ASTM C518	
1½" Thickness		7.5 (1.32)
2" Thickness		10 (1.76)
@ 40°F (4.4°C) mean temperature		
1½" Thickness		8.1 (1.43)
2" Thickness		10.8 (1.90)
Long Term Thermal Resistance, LTTR-Value[3], minimum hr•ft^2•°F/Btu (RSI, °C•m^2/W)		
@ 75°F (24°C) mean temperature	CAN/ULC S770-03	
1½" Thickness		7.8 (1.37)
2" Thickness		10.6 (1.87)
Compressive Strength[4], minimum psi (kPa)	ASTM D1621	15 (103)
Flexural Strength[5], minimum psi (kPa)	ASTM C203	60 (414)
Water Absorption[6], maximum % by volume	ASTM C272	0.10
Water Vapor Permeance[7], maximum perm (ng/Pa•s•m^2)	ASTM E96	1.5 (86)
Dimensional Stability, maximum % linear change	ASTM D2126	2.0
Flame Spread[8, 9]	ASTM E84	5
Smoke Developed[8, 9, 10]	ASTM E84	45-175
Oxygen Index[8], minimum % by volume	ASTM D2863	24
Service Temperature, maximum °F (°C)	—	165 (74)
Linear Coefficient of Thermal Expansion, in/in/°F (m/m°/C)	ASTM E228	3.5×10^{-5} (6.3×10^{-5})

1. Properties shown are representative values for 1" thick material, unless otherwise specified.
2. Modified as required to meet ASTM C578.
3. R means the resistance to heat flow; the higher the value, the greater the insulation power. This insulation must be installed properly to get the marked R-value. Follow the manufacturer's instructions carefully. If a manufacturer's fact sheet is not provided with the material shipment, request this and review it carefully. R-values vary depending on many factors including the mean temperature at which the test is conducted, and the age of the sample at the time of testing. Because rigid foam plastic insulation products are not all aged in accordance with the same standards, it is useful to publish comparison R-value data. The R-value for FOAMULAR® XPS insulation is provided from testing at two mean temperatures, 40°F and 75°F, and from two aging (conditioning) techniques, 180 day real-time aged (as mandated by ASTM C578) and a method of accelerated aging sometimes called "Long Term Thermal Resistance" (LTTR) per CAN/ULC S770-03. The R-value at 180 day real-time age and 75°F mean temperature is commonly used to compare products and is the value printed on the product.
4. Values at yield or 10% deflection, whichever occurs first.
5. Value at yield or 5%, whichever occurs first.
6. Data ranges from 0.00 to value shown due to the level of precision of the test method.
7. Water vapor permeance decreases as thickness increases.
8. These laboratory tests are not intended to describe the hazards presented by this material under actual fire conditions.
9. Data from Underwriters Laboratories Inc.® classified. See Classification Certificate U-197.
10. ASTM E 84 is thickness-dependent, therefore a range of values is given.

Environmental and Sustainability

Owens Corning is a worldwide leader in building material systems, insulation and composite solutions, delivering a broad range of high-quality products and services. Owens Corning is committed to driving sustainability by delivering solutions, transforming markets and enhancing lives. More information can be found at www.sustainability.owenscorning.com.

Warranty

FOAMULAR® XPS insulation limited lifetime warranty maintains 90% of its R-value for the lifetime of the building and covers all ASTM C578 properties. See actual warranty for complete details, limitations and requirements at www.foamular.com or www.owenscorningcommercial.com.

FOAMULAR® INSULPINK®–Z
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Product and Packaging Data
FOAMULAR® INSULPINK®–Z XPS Insulation

Material	Packaging
Extruded polystyrene closed-cell foam panel with continuous skins on top and bottom surfaces.	Shipped in poly-wrapped units with individually wrapped or banded bundles.

Thickness (in)	Product Dimensions Thickness (in) x Width (in) x Length (in)	Pallet (Unit) Dimensions (typical) Width (ft) x Length (ft) x Height (ft)	Square feet per Pallet	Board feet per Pallet	Bundles per Pallet	Pieces per Bundle	Pieces per Pallet	Edges
1½	1.5 x 23.875 x 96	4 x 8 x 8	2,037	3,056	8	16	128	Square
2	2 x 23.875 x 96	4 x 8 x 8	1,528	3,056	8	12	96	

1. Product availability and lead times vary by region and by product. Consult your local Owens Corning sales representative for availability and lead times.

Notes

1. R means the resistance to heat flow; the higher the R-value, the greater the insulating power.
2. See actual warranty for complete details, limitations and requirements.

All products described here may not be available in all geographic markets. Consult your local sales office representative for more information.

For more information on the Owens Corning family of building products, contact your Owens Corning dealer, call 1-800-GET-PINK®, or access our web sites: www.foamular.com and www.owenscorning.com.

FOAMULAR® INSULPINK®–Z

Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Disclaimer of Liability

Technical information contained herein is furnished without charge or obligation and is given and accepted at recipient's sole risk. Because conditions of use may vary and are beyond our control, Owens Corning makes no representation about, and is not responsible or liable for the accuracy or reliability of data associated with particular uses of any product described herein.

SCS Global Services provides independent verification of recycled content in building materials and verifies recycled content claims made by manufacturers. For more information, visit www.SCSglobalservices.com.

GREENGUARD Certified products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage. For more information, visit ul.com/gg.

This Home Innovation Research Labs Green Approved mark is your assurance that a product is eligible for points toward National Green Building Certification. Visit www.GreenApprovedProducts.com for details.

LEED is a registered trademark of the U.S. Green Building Council.

GREENGUARD PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818 GOLD

GREENGUARD PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS UL.COM/GG UL 2818

CERTIFIED RECYCLED CONTENT SCS GLOBAL SERVICES

AVERAGE 20% RECYCLED CONTENT PRE-CONSUMER

Home Innovation NGBS GREEN CERTIFIED™

Home Innovation NGBS Green Certified for Water Resistive Barrier, Low Emitting

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1-800-GET-PINK®
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FOAMULAR® Tapered Roofing Products
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Energy-Saving[1], Moisture Resistant XPS Insulation

THERMAPINK® 25 Tapered Insulation: ASTM C578 Type IV, 25 psi minimum

FOAMULAR® 400 Tapered Insulation: ASTM C578 Type VI, 40 psi minimum

FOAMULAR® 600 Tapered Insulation: ASTM C578 Type VII, 60 psi minimum

Description

Owens Corning™ FOAMULAR® Tapered Roofing Products Extruded Polystyrene (XPS) Rigid Foam Insulation provide performance and value in low slope roofing systems and are designed to be used over structural roof decks. THERMAPINK® tapered roof insulation provides a thermally efficient, moisture-resistant positive drainage slope for use under single-ply or other types of roofing systems.

Tapered roof insulation systems are designed to provide a minimum slope of ¼" per foot, as required by the International Building Code (IBC), toward roof drains or scupper drains leaving no flat areas for ponding. Other slopes are available and provide additional flexibility for design.

The use of FOAMULAR® Tapered Roofing Products Extruded Polystyrene (XPS) Rigid Foam Insulation provides a sustainable roofing solution, helping to prevent ponding and damaging ice buildup in winter, while in summer resisting the growth of fungus and vegetation.

FOAMULAR® Tapered Roofing Products Extruded Polystyrene (XPS) Rigid Foam Insulation are available in three types. Tapered THERMAPINK® 25 (ASTM C578 Type IV) is the most commonly used tapered product, but for applications that require higher compressive strengths, tapered FOAMULAR® 400 (ASTM C578 Type VI) and tapered FOAMULAR® 600 (ASTM C578 Type VII) are available. All FOAMULAR® Tapered Roofing Products Extruded Polystyrene (XPS) Rigid Foam Insulation are closed cell, moisture-resistant rigid foam boards and are made with Owens Corning's patented Hydrovac® process technology under strict quality control measures. This makes it highly resistant to moisture and permits the product to retain its high R-value year after year even after prolonged exposure to moisture, and freeze/thaw cycling.

Owens Corning provides tapered roofing design services with detailed tapered layouts to describe quantities and how the insulation is to be installed. See your Commercial Area Sales Representative to request tapered roofing services or email GETTECH@owenscorning.com or call 1-800-GET-PINK®.

Key Features

- Excellent long-term stable insulating performance at R-5 per inch[2]
- Provides positive slope drainage for low slope roofing assemblies
- Exceptional moisture resistance, long-term durability
- Limited lifetime warranty covers all ASTM C578 properties with a 90% R-value retention.[3]
- The only XPS foam to have achieved GREENGUARD Gold Certification
- The only XPS foam with certified recycled content—certified by Scientific Certification Systems (SCS) to contain a minimum 20% recycled content
- Will not corrode, rot or support mold growth
- Zero ozone depletion potential with 70% less global warming potential than the previous formula
- Reusable

1 Savings vary. Find out why in the seller's fact sheet on R-values. Higher R-values mean greater insulating power.

2 R means the resistance to heat flow; the higher the R-value, the greater the insulating power.

3 See actual warranty for complete details, limitations and requirements.

FOAMULAR® Tapered Roofing Products
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

- Lightweight, durable rigid foam panels are easy to handle and install
- Easy to saw, cut or score

Technical Information

The roof designer must specify the number and location of roof drains as well as the minimum roof slope required for projects using Owens Corning™ THERMAPINK® tapered roof insulation. Please note that Chapter 15 of the IBC requires a minimum slope of ¼" per foot for many new construction roofing systems, while requiring only positive slope for reroof systems. Owens Corning™ THERMAPINK® tapered roof insulation is available in ¼" and ⅛" slopes as well as other custom slopes on request.

THERMAPINK® tapered roof insulation has been tested over steel roof decks without a thermal barrier in accordance with UL Standard 1256 and is listed for use direct to deck in accordance with UL Roof Deck Construction #457. If the tapered maximum thickness exceeds that permitted by #457, a thermal barrier may be required. Check local codes for additional requirements. This product is combustible. For additional information, consult MSDS or contact Owens Corning World Headquarters at 1-800-GET-PINK®.

All construction should be evaluated for the necessity to provide vapor retarders. See current ASHRAE Handbook of Fundamentals.

Typical Physical Properties[1]

FOAMULAR® Tapered Roofing Products Exturded Polystyrene (XPS) Rigid Foam Insulation

Property	Test Method[2]	FOAMULAR® Tapered Products		
		Tapered TP25	Tapered F400	Tapered F600
Thermal Resistance[3], R-Value (180 day) minimum, hr•ft²•°F/Btu (RSI, °C•m²/W)	ASTM C518			
@ 75°F (24°C) mean temperature			5.0 (0.88)	
@ 40°F (4.4°C) mean temperature			5.4 (0.95)	
Compressive Strength[4], minimum psi (kPa)	ASTM D1621	25 (172)	40 (276)	60 (414)
Flexural Strength[5], minimum psi (kPa)	ASTM C203	75 (517)	115 (793)	140 (965)
Water Absorption[6], maximum % by volume	ASTM C272	0.10	0.05	0.05
Water Vapor Permeance[7], maximum perm (ng/Pa•s•m²)	ASTM E96	1.5 (86)	1.1 (63)	1.1 (63)
Dimensional Stability, maximum % linear change	ASTM D2126		2.0	
Flame Spread[8, 9]	ASTM E84		5	
Smoke Developed[8, 9, 10]	ASTM E84		45-175	
Oxygen Index[8], minimum % by volume	ASTM D2863		24	
Service Temperature, maximum °F (°C)	—		165 (74)	
Linear Coefficient of Thermal Expansion, in/in/°F (m/m/°C)	ASTM E228		3.5×10^{-5} (6.3×10^{-5})	

1. Properties shown are representative values for 1" thick material, unless otherwise specified.
2. Modified as required to meet ASTM C578.
3. R means the resistance to heat flow; the higher the value, the greater the insulation power. This insulation must be installed properly to get the marked R-value. Follow the manufacturer's instructions carefully. If a manufacturer's fact sheet is not provided with the material shipment, request this and review it carefully. R-values vary depending on many factors including the mean temperature at which the test is conducted, and the age of the sample at the time of testing. Because rigid foam plastic insulation products are not all aged in accordance with the same standards, it is useful to publish comparison R-value data. The R-value for FOAMULAR® XPS Insulation is provided from testing at two mean temperatures, 40°F and 75°F, and from two aging (conditioning) techniques, 180 day real-time aged (as mandated by ASTM C578) and a method of accelerated aging sometimes called "Long Term Thermal Resistance" (LTTR) per CAN/ULC S770-03. The R-value at 180 day real-time age and 75°F mean temperature is commonly used to compare products and is the value printed on the product.
4. Values at yield or 10% deflection, whichever occurs first.
5. Value at yield or 5%, whichever occurs first.
6. Data ranges from 0.00 to value shown due to the level of precision of the test method.
7. Water vapor permeance decreases as thickness increases.
8. This laboratory test is not intended to describe the hazards presented by this material under actual fire conditions.
9. Data from Underwriters Laboratories Inc.® classified. See Classification Certificate U-197.
10. Smoke Developed is thickness-dependent, therefore a range of values is given.

FOAMULAR® XPS Insulation can be exposed to the exterior during normal construction cycles. During that time some fading of color may begin due to UV exposure, and, if exposed for extended periods of time, some degradation or "dusting" of the polystyrene surface may begin. It is best if the product is covered within 60 days to minimize degradation. Once covered, the deterioration stops, and damage is limited to the thin top surface layers of cells. Cells below are generally unharmed and still useful insulation. It is recommended that all THERMAPINK® tapered roof insulation printed surfaces be turned down to minimize potential sun exposure and localized heat accumulation on the print.

FOAMULAR® Extruded Polystyrene Insulation is a thermoplastic material with a maximum service temperature of 165°F. In horizontal applications, FOAMULAR® XPS Insulation may experience greater solar exposure than in vertical applications and it may be damaged by heat buildup. Simple precautions during construction can minimize the potential for

FOAMULAR® Tapered Roofing Products
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Product and Packaging Data

FOAMULAR® Tapered Roofing Products Exturded Polystyrene (XPS) Rigid Foam Insulation

Material	Packaging
Extruded polystyrene closed-cell foam, ASTM C578 Type IV, 25 psi minimum	Shipped in poly-wrapped units with individually wrapped or banded bundles.

Thickness (in)	Product Dimensions Thickness (in) x Width (in) x Length (in)	Pallet (Unit) Dimensions (typical) Width (ft) x Length (ft) x Height (ft)	Square feet per Pallet	Board feet per Pallet	Bundles per Pallet	Pieces per Bundle	Pieces per Pallet
THERMAPINK® 25 and FOAMULAR® 600 Tapered Insulation (FOAMULAR® 400 Tapered Insulation only available in E, F and G panels.)							
⅛ slope A	0.5-0.75 x 24 x 96	4 x 8 x 8	4,608	2,880	24	12	288
⅛ slope B	0.75-1 x 24 x 96	4 x 8 x 8	3,456	3,024	18	12	216
⅛ slope C	1-1.25 x 24 x 96	4 x 8 x 8	2,688	3,024	14	12	168
⅛ slope D	1.25-1.5 x 24 x 96	4 x 8 x 8	2,304	3,168	12	12	144
¼ slope E	0.5-1 x 24 x 96	4 x 8 x 8	3,840	2,880	10	12	240
¼ slope F	1-1.5 x 24 x 96	4 x 8 x 8	2,304	2,880	12	12	144
½ slope G	0.5-1.5 x 24 x 96	4 x 8 x 8	2,688	2,688	14	12	168

1. Available lengths and edge configurations vary by thickness. See www.foamular.com for current offerings. Other sizes may be available upon request. Consult your local Owens Corning representative for availability.

Standard Product Availability

FOAMULAR® Tapered Roofing Products

Panel	THERMAPINK® 25 Taper Insulation	FOAMULAR® 400 Taper Insulation	FOAMULAR® 600 Taper Insulation
⅛ slope A	×		×
⅛ slope B	×		×
⅛ slope C	×		×
⅛ slope D	×		×
¼ slope E	×	×	×
¼ slope F	×	×	×
½ slope G	×	×	×

heat related damage. Install only as much FOAMULAR® XPS Insulation as can be covered in the same day. For horizontal applications always turn the print side down so the black print does not show to the sun which may, at times, act as a solar collector and raise the temperature of the foam surface under the print. Additional protection over FOAMULAR® XPS Insulation such as added cover boards, reflective membrane surfaces, or pavers may be required in areas adjacent to reflective walls, parapets, rooftop equipment areas or other vertical surfaces that may reflect and intensify the sun's energy. Do not cover FOAMULAR® XPS Insulation either stored (factory wrapped or unwrapped), or partially installed, with dark colored (non-white), or clear (non-opaque) coverings and leave it exposed to the sun. Examples of such coverings include but are not limited to filter fabrics, membranes, temporary tarps, clear polyethylene, etc. If improperly covered, and exposed to the right combination of sun, time and temperature, deformation damage may occur rapidly. When covering is necessary, use only white opaque material, or, cover with the final approved finish material as soon as possible. A white opaque cover reflects energy from the sun rather than absorbing it or passing it which reduces the potential for excessive heat exposure. Clear (non-opaque) coverings allow light energy from the sun to pass through rather than reflect it which may produce a partial greenhouse effect, trapping hot air and raising the temperature below the cover.
See Owens Corning publication number 10015704, "Heat Build Up Due to Solar Exposure" for more information.

Standards, Codes Compliance

- Meets ASTM C 578 Type IV (TP 25), Type VI (FOAMULAR® 400 insulation), Type VII (FOAMULAR® 600 insulation)
- UL (Underwriters Laboratories) Classified. A copy of UL Classification Certificate U-197 is available at www.owenscorning.com
- See ICC-ES Evaluation Report ESR-1061 at www.icc-es.org
- THERMAPINK® 25: UL Roof Deck Constructions, tested in accordance with UL 1256, "Standard for Fire Test of Roof Deck Constructions" including Roof Deck Construction #457.

FOAMULAR® Tapered Roofing Products
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

FOAMULAR® 400 and 600 were not tested direct to deck and are not included in UL #457 for direct to deck applications.

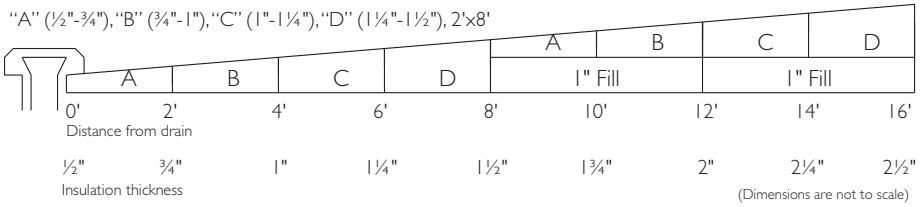
- Refer to www.ul.com "Certifications" or FM Approval RoofNav for details on listings, constructions and assemblies
  - FM (Factory Mutual) Class 1 Roof Decks.
  - ASTM E108 Fire Classified Assemblies.
  - ASTM E119 Fire Resistance Rated Roof/Ceiling Assemblies.
  - UL and FM Wind Uplift Rated Assemblies.
  - Meets California Quality Standards and HUD UM #71a
  - Compliance verification by RADCO (AA-650)

Certifications and Sustainable Features of FOAMULAR® XPS Insulation

- FOAMULAR® XPS Insulation is reusable
- FOAMULAR® XPS Insulation is made with a zero ozone depletion formula
- Certified by Scientific Certification Systems to contain a minimum of 20% pre-consumer recycled polystyrene
- Certified to meet indoor air quality standards under the stringent GREENGUARD Certification Program and GREENGUARD Gold Certification Program

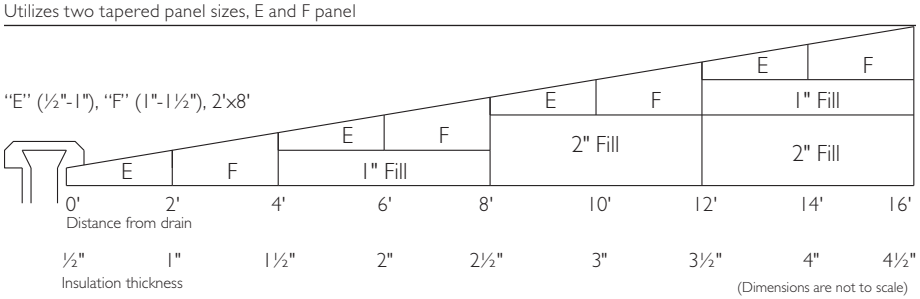
Typical Tapered Roofing Section ⅛" per foot slope

Utilizes four tapered panel sizes, A, B, C and D panel



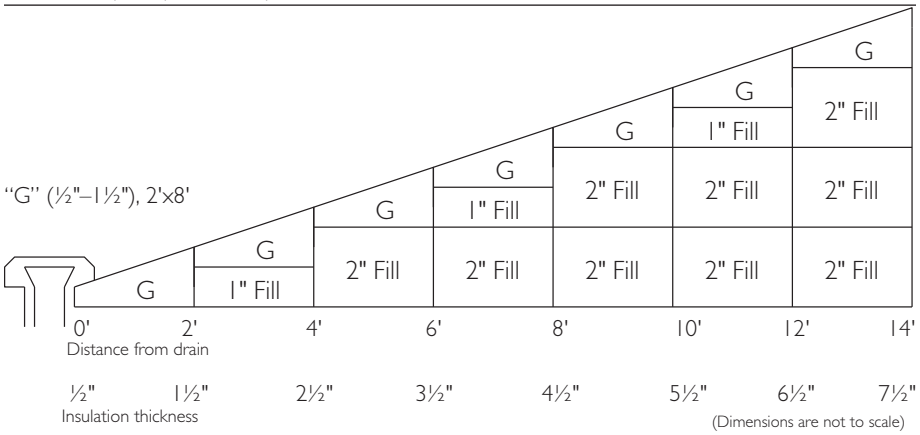
Typical Tapered Roofing Section ¼" per foot slope

Utilizes two tapered panel sizes, E and F panel



Typical Tapered Roofing Section ½" per foot slope

Utilizes one tapered panel size, G panel



System Average R-Value

Distance from Drain	0'–4'	0'–8'	0'–12'	0'–16'	0'–20'
Average R-value[1] ⅛" slope	3.75	5.00	6.25	7.50	8.75
¼" slope	5.00	7.50	10.00	12.50	15.00
½" slope	7.50	12.50	17.50	22.50	27.50

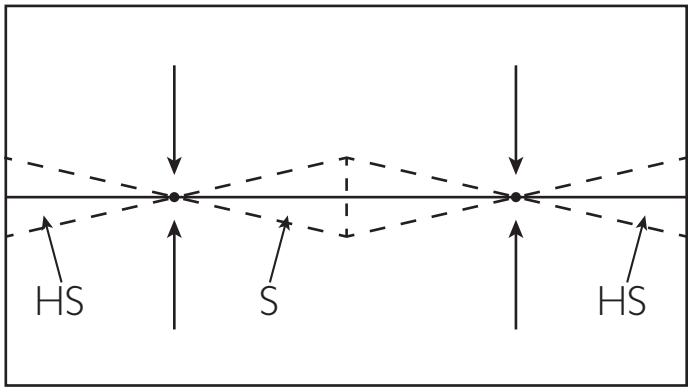
1. Average R-value @ 75°F (24°C) mean temperature

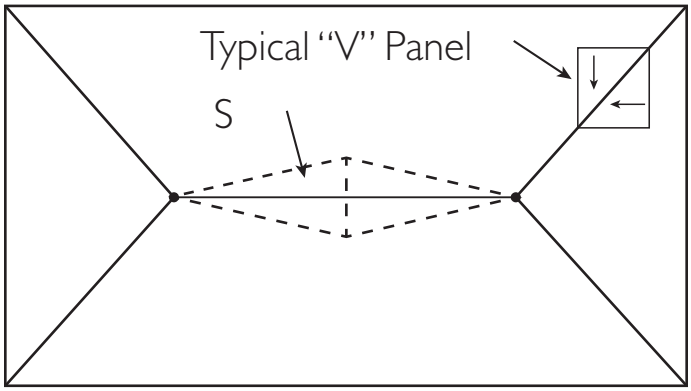
FOAMULAR® Tapered Roofing Products
Extruded Polystyrene (XPS) Rigid Foam Insulation

Product Data Sheet

Typical Tapered Layouts

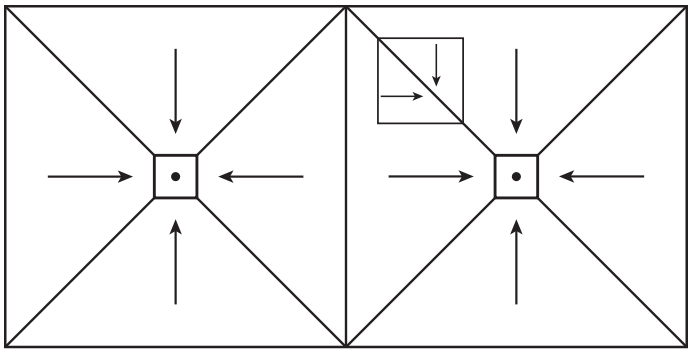
Cricket and saddle material are included in the design package for field fabrication.

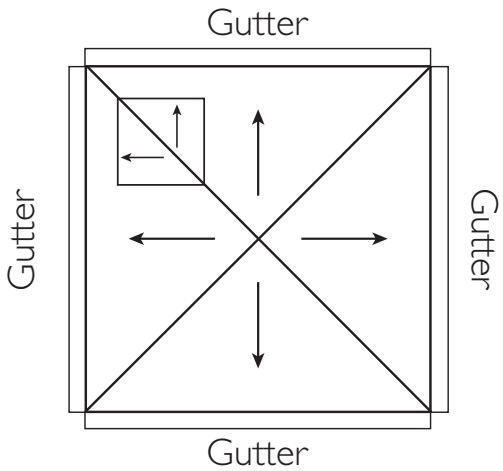




1. Two-Directional Taper System
Utilizes tapered panels installed in two directions, accompanied with saddles ("S") between the drains, and half saddles ("HS") between drains and outside walls. The saddles assist in directing the water flow to the drains.

2. Modified Two-Directional Taper System
Utilizes tapered panels installed primarily in two directions with saddle ("S") placed between the drains; however, two of the four sides utilize mitered valleys. This system is desirable when a constant thickness of insulation is required at the outside perimeter of the roof.





3. Four-Directional Taper System
This system utilizes tapered panels installed in four different directions. Mitered valleys lead to drains.

4. Four-Directional Taper System—Perimeter Drainage
Utilizes a four-way taper system directing the water flow to the outside perimeter. This system may be selected when gutters are employed rather than roof drains. Desired drainage is obtained with the creation of hip miters.

- Approved under the Home Innovation Research Labs NGBS Green Certification Program
- Utilizing FOAMULAR® XPS Insulation can help achieve green building certifications including the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) certification

Environmental and Sustainability

Owens Corning is a worldwide leader in building material systems, insulation and composite solutions, delivering a broad range of high-quality products and services. Owens Corning is committed to driving sustainability by delivering solutions, transforming markets and enhancing lives. More information can be found at http://sustainability.owenscorning.com.

Warranty

FOAMULAR® XPS Insulation is warranted to maintain 90% of its R-value and to retain all other properties defined in ASTM C578 for the lifetime of the building. See the actual warranty for complete details, limitations and requirements at www.owenscorning.com.

All products described here may not be available in all geographic markets. Consult your local sales office representative for more information.

For more information on the Owens Corning family of building products, contact your Owens Corning dealer, call 1-800-GET-PINK®, or access www.owenscorning.com.

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SECTION 07550 MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Preparation of Substrate to Receive Roofing Materials

B. Roof Insulation Application to Prepared Substrate

C. Roof Membrane Application

D. Roof Flashing Application

E. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Sheet Metal Flashing and Trim

B. Sheet Metal Roofing Specialties

1.03 RELATED SECTIONS

A. Section 6 - MIscellaneous Carpentry

B. Section 6 - Sheathing

C. Section 7 - Building Insulation

D. Section 7 - Sheet Metal Flashing and Trim

E. Section 7 - Roofing Accessories

1.04 REFERENCE STANDARDS

References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM American Society for Testing and Materials
Philadelphia, PA

FM	Factory Mutual Engineering Research Corp Norwood, MA
NRCA	National Roofing Contractors Association Rosemont, IL
CERTA	Certified Roofing Torch Applicators Rosemont, IL
OSHA	Occupational Safety and Health Administration Washington, DC
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Chantilly, VA
UL	Underwriters Laboratories Northbrook, IL

1.05 SUBMITTALS

All submittals which do not conform to the following requirements will be rejected.

A. Submittals Prior to Contract Award:

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.

2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the Manufacturer's requirements in order to qualify the project for the specified guarantee.

1.06 QUALITY ASSURANCE

A. Acceptable Products: Provide primary roofing products, including each type of sheet, all manufactured in the United States, supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. Provide secondary or accessory products which are acceptable to the manufacturer of the primary roofing products.

B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001:2000 audit process. A certificate of analysis

for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.

C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.

1. Underwriters Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.

2. Florida Building Code: Tested and approved for use in HVHZ zone for a minimum field design pressure of -67.5 SPF

D. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies (with method of attachment, and fastener type), and manufacturer's membrane assembly proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval, through this process, prior to shipment of materials to the project site.

E. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.

F. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

G. Manufacturer Requirements: The primary roofing materials manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.

1.07 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.08 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.

2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for all performance of the work.

3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

2. Temperature Restrictions – self-adhered sheets: The minimum required substrate temperature at point of application is 40°F (4°C). Maintain a minimum roof membrane material temperature above 50°F (10°C). In low temperature conditions, materials should be kept warm prior to application. Suspend

application in situations where the self-adhered base ply cannot be kept at temperatures allowing for proper adhesion.

C. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.

2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.

3. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.

4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.

5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.09 GUARANTEE/WARRANTY

A. Roof Membrane Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's twenty year labor and materials membrane guarantee. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner. This guarantee shall not exclude random areas of ponding from coverage.

> Siplast twenty year Roof Membrane Guarantee

PART 2 PRODUCTS

2.01 The basic product descriptions required in this specification are referenced below.

Deck: Steel roof deck
Tapered Insulation: Tapered Paratherm system by Siplast, having a minimum thickness of 1.5 inches, providing for a roof slope of 1/4 inch
Insulation - Top Layer: DensDeck Prime by Georgia-Pacific, having a thickness of 1/2 inch, simultaneously mechanically attached with tapered. 1 fastener per 1.6 s.f. in the field of the roof
Roof System: Paradiene 20 TG, torch applied.
Paradiene 30 FR TG, torch applied.
Flashing System: Veral Aluminum, torch applied.

2.02 DESCRIPTION OF SYSTEMS

A. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, applied over a prepared substrate. The reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The back of modified bitumen base ply shall be coated with factory applied polymer modified asphalt self-adhesive stripes staggered diagonally on the back surface of the sheet with an acrylic coating applied between the stripes to provide a bonded area of 50% of the total surface area. The back side of the base ply shall be surfaced with a removable film. The finish ply shall be coated one side with a torch grade SBS bitumen blend adhesive layer. The adhesive layer shall be manufactured using a process that embosses the surface with a grooved pattern to provide optimum burn-off of the plastic film and to maximize application rates. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14°F (-10°C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147.

Siplast Paradiene 20 TG/30 FR TG torchable roof system

1. Modified Bitumen Base Ply

   - Siplast Paradiene 20 - torchable grade

2. Modified Bitumen Stripping Ply

   > Siplast Paradiene 20 - torchable grade

3. Modified Bitumen Finish Ply

   > Siplast Paradiene 30 FR - torchable grade

B. Flashing Membrane Assembly: A flashing membrane assembly consisting of a prefabricated, reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified

asphalt membrane with a continuous, channel-embossed metal-foil surfacing. The finish ply shall conform to ASTM D 6298 and the following physical and mechanical property requirements.

> Siplast Veral flashing system, aluminum finish

1. Cant Backing Sheet and Flashing Reinforcing Ply

   > Siplast Paradiene 20 SA

2. Metal-Clad Modified Bitumen Flashing Sheet

   > Siplast Veral Aluminum

C. Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed polymethyl methacrylate primer, basecoat and topcoat, combined with a non-woven polyester fleece. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application.

   > Parapro 123 Flashing System by Siplast; Irving, TX

2.03 ROOFING ACCESSORIES

A. Bituminous Cutback Materials

1. Primer: An asphalt/solvent blend meeting ASTM D 41, South Coast Air Quality District and Ozone Transport Commission requirements.

   > Siplast PA-917 LS Primer by Siplast; Irving, TX

2. Primer: A high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D 41 requirements.

   > Siplast PA-1125 Asphalt Primer by Siplast; Irving, TX

3. Mastics: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements.

   > Siplast PA-1021 Plastic Cement by Siplast; Irving, TX

B. Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

> Siplast PS-304 Elastomeric Sealant by Siplast; Irving, TX

C. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

D. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4 inch dimension.

E. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.

1. Thickness: 0.217 in (5.5 mm)
2. Weight: 1.8 lb/ft² (8.8 kg/m²)
3. Width: 30 in (76.2 cm)

> Paratread Roof Protection Material by Siplast; Irving, TX

PART 3 EXECUTION

3.01 PREPARATION

A. General:

Surface Preparation: The roofing contractor shall be responsible for the inspection of the deck surface as to suitability for roofing. Do not proceed with any part of the application until all defects have been corrected and completed. Secure insulation as approved by the Manufacturer.

3.02 SUBSTRATE PREPARATION

See the Siplast Rigid Insulation and Base Sheet Usage Guide section of the Siplast Engineered Roofing Systems Manual for information regarding approved rigid insulation and applicable installation methods. Paradiene 20 TG must be applied over a Siplast approved substrate, such as primed structural concrete or DensDeck Prime.

3.03 ROOF MEMBRANE INSTALLATION

A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.

B. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules and exercise care in ensuring that the finished application is acceptable to the Owner.

C. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.

D. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.

E. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.

1. Apply all layers of roofing perpendicular to the slope of the deck.

2. Unroll the base ply, and set the roll into place utilizing minimum 3 inch side and end laps. Fold one end of the roll back onto itself by 24 inches. Peel the release film off of the back of the 24 inch end section of the sheet and lay into place, pressing the 24 inch end section of the sheet firmly into place over the substrate. Pull the release film free from the underside of the remainder of the sheet while pressing the material into place with a follow tool as the film is being removed, leaving the end laps unadhered. Prior to adhering the end laps, cut a dog ear angle at each end lap on overlapping selvage edges. Torch apply end laps, ensuring that the adhesive stripes on the underside of the overlapping sheet and the top surface of the underlying sheet flow into a layer of continuously bonded or fused asphalt. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet. Laps of the base ply must not be left exposed overnight. The base ply application must be immediately followed by the application of the finish ply. A phased application between the base and finish is not approved. In cases where rapid onset of inclement weather occurs, all exposed lap edges should be heat sealed with a torch and trowel, or heat welded.

3. Prior to application of the finish ply, ensure that the base ply seams are firmly sealed without wrinkles and/or fishmouths. Fully torch the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.

4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.

F. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.

G. Flashing Application - masonry surfaces: Flash masonry parapet walls and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied and extended to the top of the cant, use a torch to burn off the top surfacing film of the base ply where it will be lapped beneath the reinforcing sheet. Cut the reinforcing sheet into lengths that can be easily handled and peel the release film from the back of the sheet, leaving the film on the back portion of the sheet that will extend above the top of the cant. Set the sheet into place utilizing minimum 3 inch side laps, extending a minimum of 3 inches onto the base ply surface and 3 inches up the parapet wall above the cant. Apply the reinforcing sheet above the top of the cant by removing the film and using a torch or hot air gun. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granule surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9 inch centers. (See manufacturer's schematic for visual interpretation).

I. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer’s printed installer’s guidelines and other applicable written recommendations as provided by the manufacturer.

J. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.04 FIELD QUALITY CONTROL AND INSPECTIONS

A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.

B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

C. Final Inspection

1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

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SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglet and counterflashing.
2. Formed roof drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

C. Samples: For each exposed product and for each finish specified.

D. Maintenance data.

E. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

B. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Factory-Painted Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).

C. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 REGLETS

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Aluminum, 0.024 inch (0.61 mm) thick
2. Finish: Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

C. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

F. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Hanger Style: Flat strap
2. Fabricate from the following materials:
   a. Aluminum: 0.024 inch (0.61 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop and Fascia Cap): Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Fabricate from the following materials:
   1. Aluminum: 0.050 inch (1.27 mm) thick.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight. Fabricate from the following materials:
   1. Aluminum: 0.050 inch (1.27 mm) thick.

C. Base Flashing: Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings. Form with 2-inch- (50-mm-) high, end dams where flashing is discontinuous. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

B. Wall Expansion-Joint Cover: Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 8 feet (2.4 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate \existing decking not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws; metal decking to be not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at no less than 48 inches (1500 mm) o.c. in between.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to

interior wall face, over cants or tapered edge strips, and under roofing membrane.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch (25 mm) below scupper discharge.

F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 12-inch (300-mm) centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 16-inch (400-mm) centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions.

END OF SECTION 07620

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SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, Shop Drawings, and color Samples.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275).

2.2 ROOF ACCESSORIES

A. Roof Curbs and Equipment Supports: Fabricate from 0.0747-inch- (1.9-mm-) thick, galvanized structural steel; factory primed and prepared for painting with welded or sealed mechanical corner joints.

1. Provide units with cant strips and base profile coordinated with roof insulation thickness and roof deck slope.
2. Provide preservative-treated wood nailers at tops of curbs.
3. Provide manufacturer's standard rigid or semirigid insulation.
4. The Pate Company
5. Or Architect approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation: Unless otherwise indicated, install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual." Coordinate with installation of roof deck, vapor barriers, roof insulation, roofing, and flashing to ensure combined elements are secure, waterproof, and weather tight.

END OF SECTION 07720

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SECTION 07841 PENETRATION FIRESTOPPING

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 through-penetration firestop systems for penetrations through the following fire-resistance rated assemblies, including both blank openings and openings containing penetrating items:

B.

1. Walls and partitions.
2. Smoke barriers.

C. Related Sections include the following:

1. Division 4 – Unit Masonry
2. Division 7 — Joint Sealers
3. Division 9 – Gypsum Drywall
4. Division 15 – Basic Mechanical Materials and Methods
5. Division 15 – Mechanical Insulation
6. Division 16 – Basic Electrical Materials and Methods

1.3 PERFORMANCE CRITERIA

A. FIRE TEST REQUIREMENTS

1. Underwriters Laboratories, Inc. (UL):
   a. ANSI/ UL1479, “Fire Tests of Through Penetration Firestops”.
   b. ANSI/ UL263, “Fire Tests of Building Construction and Materials”.
   c. ANSI/ UL723, “Surface Burning Characteristics of Building Materials”.
2. American Society of Testing and Materials (ASTM):
   a. ASTM E-814, “Fire Tests of Through Penetration Firestops”.
   b. ASTM E-119, “Fire Tests of Building Construction and Materials”.
   c. ASTM E-84, “Surface Burning Characteristics of Building Materials”.

B. REFERENCES

1. Underwriters Laboratories (UL) of Northbrook, IL "Fire Resistance Directory".
   a. Through Penetration Firestop Systems (XHEZ)
   b. Fill, Void or Cavity Materials (XHHW)
   c. Firestop Devices (XHJI)
   d. Wall Opening Protective Materials (CLIV)
2. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 101: Life Safety Code".
3. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 70: National Electrical Code".

C. PERFORMANCE REQUIREMENTS

1. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
2. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
3. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
4. Openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
5. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
6. Provide through-penetration firestop systems and fire-resistive joint systems subjected to an air leakage test conducted in accordance with the Standards, ANSI/ UL1479 for penetrations, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the firestop system to restrict the movement of smoke.
7. Provide T-Rating Collar Devices tested in accordance with ASTM E-814 or ANSI/UL1479 for metallic pipe penetrations requiring T-Ratings per the applicable building code.

1.4 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.5 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Criteria" Article:
   1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.

B. Engage an experienced installer who is certified, licensed, FM Approved in accordance with FM 4991, Classified by UL as a Qualified Contractor, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer's willingness to sell its firestopping products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.

C. Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.7 PROJECT CONDITIONS

A. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install through-penetration firestop systems when substrates are wet due to rain, frost, condensation, or other causes.

C. Do not use materials that contain flammable solvents.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 – PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
   1. Specified Technologies, Inc. (STI), Somerville, New Jersey
      800 – 992 – 1180

2. Other manufacturers listed in the UL Fire Resistance Directory – Volume 2.

2.3 MATERIALS

A. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant
2. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant
3. Specified Technologies, Inc. (STI) SpecSeal Series LC Endothermic Sealant
4. Specified Technologies, Inc. (STI) SpecSeal Series AS Elastomeric Spray

C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars

D. Wall Opening Protective Materials: Intumescent, non-curing pads or inserts for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24”, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty Pads
2. Specified Technologies, Inc. (STI) SpecSeal Series EP PowerShield Insert Pads

E. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series RED Wrap Strip
2. Specified Technologies, Inc. (STI) SpecSeal Series BLU Wrap Strip

F. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSB Firestop Pillows

G. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSM Firestop Mortar

H. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal SIL300 Silicone Firestop Sealant
   2. Specified Technologies, Inc. (STI) SpecSeal SIL300SL Self-Leveling Silicone Firestop Sealant

I. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) Pensil 200 Silicone Foam

J. Composite Sheet: Intumescent material sandwiched between a galvanized steel sheet and steel wire mesh protected with aluminum foil, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal CS Composite Sheet

K. Cast-In-Place Firestop Device: Single component molded firestop device installed on forms prior to concrete placement with totally encapsulated, tamper-proof integral firestop system and smoke sealing gasket, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal CD Cast-In Firestop Device

L. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use on steel HVAC ducts, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal FyreFlange Firestop Angles

M. Firestop Plugs: Re-enterable, foam rubber plug impregnated with intumescent material for use in blank openings and cable sleeves, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series FP Firestop Plug

N. Fire-Rated T Rating Collar Device: Louvered steel collar system with synthetic aluminized polymer coolant wrap installed on metallic pipes where

T Ratings are required by applicable building code requirements, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal T-Collar Device

PART 3 – EXECUTION

3.1 PREPARATION

A. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General Requirements: Install through-penetration firestop systems in accordance with “Performance Criteria” Article and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer’s Instructions: Comply with manufacturer’s instructions for installation of through-penetration firestop systems products.

1. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.
2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of through-penetration 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.

3.3 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage a qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.4 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 PRECONSTRUCTION TESTING

A. Preconstruction compatibility and adhesion testing.

B. Preconstruction field-adhesion testing.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Control and expansion joints in unit masonry.
   b. Perimeter joints between materials above and frames of doors, windows & louvers.
   c. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Joints between different materials listed above.
   c. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Perimeter joints between interior walls and frames of interior doors and windows.
   d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   e. Other joints as indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 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.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Single-Component Nonsag Polysulfide Sealant ES-1:

1. Available Products:

   a. Pacific Polymers, Inc.; Elastoseal 230 Type I (Gun Grade).
   b. Polymeric Systems Inc.; PSI-7000.
   c. Or approved equal

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-2:

1. Available Products:

   a. Pecora Corporation; 898 Sanitary Silicone Sealant, white.
   b. Tremco; Tremsil 600 White.
   c. GE Silicones; Sanitary 1700
   d. Dow Corning Corp; 786
   e. Or approved equal.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.

4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Sika Corporation, Inc.; Sikaflex - 1CSL.
    b. Sonneborn, Division of ChemRex Inc.; SL 1.
    c. Or approved equal.

6. Type and Grade: S (single component) and P (pourable).
7. Class: 25.
8. Uses Related to Exposure: T (traffic) and NT (nontraffic).
9. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

E. Single-Component Non-sag Urethane Sealant ES-4:

1. Available Products:

    a. Sika Corporation, Inc.; Sikaflex – 1a.
    b. Sonneborn, Division of ChemRex Inc.; NP 1
    c. Tremco Vulkem 116
    d. Or approved equal.

2. Type and Grade: S (single component) and NS (non-sag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.

B. Available Products:

1. Pecora Corporation; AC-20+.
2. Sonneborn, Division of ChemRex Inc.; Sonolac.
3. Tremco; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) O (open-cell material) B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.
c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application JS-1: Exterior vertical control and expansion joints in unit masonry. Exterior perimeter joints between Unit Masonry and frames of doors windows and louvers.

1. Joint Sealant:
   a. Single-component nonsag polysulfide sealant ES-1 OR
   b. Single-component nonsag urethane sealant ES-4
2. Joint-Sealant Color: As selected by Architect

B. Joint-Sealant Application JS-2: Exterior control and expansion joints in joints of cast-in-place concrete paving.

1. Joint Sealant:
   a. Single-component nonsag polysulfide sealant ES-1 OR
   b. Single-component nonsag pourable polyurethane sealant ES-3

2. Joint-Sealant Color: As selected by Architect.

C. Joint-Sealant Application JS-3: Interior perimeter joints of exterior openings; perimeter joints between interior wall surfaces and frames of interior doors and windows; under thresholds; acoustical sealing of partywall partitions.

1. Joint Sealant: Latex sealant LS-1.
2. Joint-Sealant Color: As selected by Architect.

D. Joint-Sealant Application JS-4: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

1. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant ES-2.

   Joint-Sealant Color: White.

END OF SECTION 07920

SECTION 08111 - HOLLOW METAL DOORS AND FRAMES

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:

Standard hollow metal flush doors and flush frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.

2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:
1. For the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

D. Other Action Submittals:
1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to ASTM E152 AND UL 10B.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings

indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Or approved equal.

2.2 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

B. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

D. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

E. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
   1. Design: As indicated .

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
   a. Fire Door Core: As required to provide fire-protection ratings indicated.
   b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 12.3 deg F x h x sq. ft. /Btu (2.166 K x sq. m/W) when tested according to ASTM C 1363.
      1) Locations: Exterior doors andinterior doors where indicated.
3. Vertical Edges for Single-Acting Doors: Beveled edge.
   a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush)

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.
   1. Fabricate frames as knocked down unless otherwise indicated.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
   1. Fabricate frames with mitered or coped corners.
   2. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
   3. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
   4. Frames for Borrowed Lights: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- ((0.5-mm-)) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.9 Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field applies bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08111

SECTION 08212 - STILE AND RAIL WOOD DOORS

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. Section Includes:

1. Interior stile and rail wood doors and sidelites.
2. Interior fire-rated, stile and rail wood doors.
3. Finishing stile and rail wood doors.
4. Prehanging doors in frames.

B. Related Sections:
1. Division 9 Section Painting for field finishing stile and rail doors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include details of construction and glazing.
2. Include factory finishing specifications.

B. Shop Drawings: For stile and rail wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data[.][, including the following:]

1. Dimensions of doors for factory fitting.
2. Locations and dimensions of mortises and holes for hardware.
3. Requirements for veneer matching.
4. Doors to be factory finished, and finish requirements.
5. Fire ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification: Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing 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.

E. Product Certificates: For each type of door, from manufacturer.

F. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain stile and rail wood doors from single manufacturer.

C. Source Limitations: Provide stile and rail wood doors finished in same shop as work in Division 6 Section "Interior Architectural Woodwork."

D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

E. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.

B. Package doors individually in opaque plastic bags or cardboard cartons.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and

HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 3/16 inch in a 42-by-84-inch (1067-by-2134-mm) section.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Exterior Doors: Two years.
b. Interior Doors: Five years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only materials that comply with referenced standards and other requirements specified.

1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
2. Assemble interior doors, frames, and sidelites, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.

B. Panel Products: Any of the following:

1. Particleboard made from wood particles, complying with ANSI A208.1, Grade M-2.
2. Medium-density fiberboard made from wood fiber, complying with ANSI A208.2, Grade 130.
3. Hardboard, complying with AHA A135.4.
4. Veneer core plywood.

2.2 INTERIOR STILE AND RAIL WOOD DOORS

A. Interior Stile and Rail Wood Doors: Stock interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by one of the following:
   a. Belentry Doors LLC.
   b. International Door and Latch.
   c. Jeld-Wen, Inc.
   d. Karona, Inc.
   e. McPhillips Manufacturing Company.
   f. QSM Doors, Inc.
   g. Simpson Door Company.
3. Finish and Grade: Transparent and Premium or Select.
4. Wood Species: Douglas fir or western hemlock, vertical sawed/sliced or Red oak, quarter sawed/sliced.
5. Stile and Rail Construction: Edge-glued solid lumber for doors with lites and veneered edge- and end-glued lumber for flush doors.
6. Flat-Panel Construction: Veneered panel product.
7. Flat-Panel Thickness: Manufacturer's standard, but not less than that required by WDMA I.S.6 for design group indicated.
8. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
9. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick complying with Division 8 Section "Glazing."
10. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6 and grade specified. Include panel design number if applicable.

2.3 INTERIOR FIRE-RATED WOOD DOOR FRAMES

A. Interior Fire-Rated Wood Door Frames: Frames, complete with casings, fabricated from solid fire-retardant-treated wood or from veneered fire-retardant particleboard, fire-retardant medium-density fiberboard, or mineral board.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Algoma Hardwoods, Inc.
   b. Eggers Industries.
   c. Maiman Company (The).
   d. Marshfield DoorSystems, Inc.

B. Species: Red oak, White oak or Douglas Fir.

2.4 STILE AND RAIL WOOD DOOR FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for field fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:

1. Clearances: Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch (10 mm) from bottom of door to top of threshold.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

C. 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.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable. Miter wood moldings at corner joints.

E. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Division 8 Section "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.

F. Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish, and quality of construction.

G. Exterior Doors: Factory treat exterior doors after fabrication with water-repellent preservative to comply with WDMA I.S.4. Flash top of outswinging doors with manufacturer's standard metal flashing.

H. Prehung Doors: Provide stile and rail doors as prehung units including doors, frames, and hardware.

1. Provide wood door frames, other than fire-rated wood door frames, that comply with Division 6 Section "Interior Architectural Woodwork]."
2. Provide hardware, thresholds,] that complies with Division 8 Section "Door Hardware."

2.5 SHOP PRIMING

A. Doors for Transparent Finish: Shop prime doors with stain (if required), other required pretreatments, and first coat of finish as specified in Division 9 Section "Wood Stains and Transparent Finishes." Seal all four edges, edges of cutouts, and mortises with first coat of finish.

2.6 FINISHING

A. Finish wood doors at woodworking shop.

B. Finish wood doors at woodworking shop that are indicated to receive transparent finish. Wood doors that are indicated to receive opaque finish may be field finished.

C. Finish wood doors at woodworking shop where indicated in schedules or on Drawings. Wood doors that are not indicated to be shop finished may be field finished.

D. For doors indicated to be shop finished, comply with WDMA I.S.6A, "Industry Standard for Architectural Stile and Rail Doors,"]and with other requirements specified.

1. Finish faces and all four edges of doors, including mortises and cutouts. Stains and fillers may be omitted onbottom edges, edges of cutouts, and mortises.

E. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Finish: Staining: Match Architect's sample as Room Finish Materials Legend in the drawings.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fire-rated wood door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Countersink fasteners, fill surface flush, and sand smooth.

B. Hardware: For installation, see Division 8 Section "Door Hardware."

C. Install wood doors to comply with manufacturer's written instructions, WDMA I.S.6A, "Industry Standard for Architectural Stile and Rail Doors," and other requirements specified.

1. Provide WI-Certified Compliance Certificate for Installation.
2. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

D. Field-Fitted 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.

1. Clearances: Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors. Provide[1/4 inch (6 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6 mm from bottom of door to top of threshold.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Shop-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08212

SECTION 08411 - ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

Show design loads, including wind loads and seismic loads, on Drawings.

A. Structural Performance: Provide systems, including anchorage, capable of withstanding loads indicated.
   1. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330-90 with allowable stress in accordance with AAMA specifications for Aluminum structures.
      Without Horizontals: L/175 or 3/4 inch (19 mm) maximum.
      With Horizontals L/175 or L/240 + 1/4 inche (6.4 mm) for spaces greater than 13 ft. 6 inches (4.1 m) but less than 40 ft. (12.2 m).
   2. Structural-Testing: Systems tested according to ASTM E 330 at 150 percent of inward and outward wind-load design pressures do not evidence material failures, structural distress, deflection failures, or permanent deformation of main framing members exceeding 0.2 percent of clear span.

B. Air Infiltration: Limited to 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of system surface area when tested according to ASTM E 283 at a static-air-pressure of 6.24 psf (299 Pa).

C. Water Infiltration: No uncontrolled water other than condensation on indoor face of any component when tested in accordance with ASTM E 331 at test pressure differential of 12 psf (575 Pa). Water test to be performed immediately after design pressure test.

D. Submittals: Product Data, Shop Drawings, and color Samples.

   1. For entrance systems, include hardware schedule and locations.

PART 2 - PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

A. YKK AP Series YHS 50 TU Impact Resistant Storefront System (Monolithic Glazing).

B. Aluminum: ASTM B 209 (ASTM B 209M) sheet; ASTM B 221 (ASTM B 221M) extrusions.

C. Glazing: Specified in Division 8 Section "Glazing."

D. Sealants and Joint Fillers: For joints at perimeter of systems as specified in Division 7 Section "Joint Sealants."

E. Doors: YKK AP Model 35H Impact Resistant Heavy Duty Swing Doors.
   1. Exterior Doors: Provide manufacturer's standard elastomer type weather stripping in replaceable rabbets for stiles and rails.
   2. Hardware: (1-1/2 to 2) pair of Grade 1 mortise butt hinges per leaf. Ball bearing 4-1/2 inch x 4 inch Brass US26D finish.
      (1) Adams Rite MS1850 three point hookbolt lock on active leaf or single door.
      (2) H-4202 Keyed cylinders (H-4204 thumbturn on inside optional). Type "A" standard YKK AP push/pull (Type "C" 1 inch diameter tubular push/pull is optional). LCN 4040 surface mounted closer (hold open optional).
      (1) E9-0502 mill finish aluminum threshold with E9-0503 adapter and E2-0051 elastomer weather-strip, counter flashed using E9-0616 extruded aluminum flashing, Threshold and flashing are wept to the exterior.

F. Fasteners and Accessories: Compatible with adjacent materials, corrosion-resistant, nonstaining, and nonbleeding. Use concealed fasteners except for application of door hardware.

G. Fabrication: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factories assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

   1. Door Framing: Reinforce to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units for hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.

H. Aluminum Finish: Comply with NAAMMs "Metal Finishes Manual for Architectural and Metal Products."

I. Fluoropolymer, two-coat coating system, complying with AAMA 605.2.
   1. Color: As selected by Architect

PART 3 - EXECUTION

3.1 INSTALLATION

A. Isolate metal surfaces in contact with incompatible metal or corrosive substrates, including wood, by painting contact surfaces with bituminous

coating or primer, or by applying sealant or tape recommended by manufacturer.

B. Install components to provide a weatherproof system.

C. Install framing components true in alignment with established lines and grades to the following tolerances:

1. Variation from Plane: Limit to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment: For surfaces abutting in line, limit offset to 1/16 inch (1.5 mm). For surfaces meeting at corners, limit offset to 1/32 inch (0.8 mm).
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

D. Install doors without warp or rack. Adjust doors and hardware to provide tight fit at contact points and smooth operation.

END OF SECTION 08411

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SECTION 08453 - FIBERGLASS SANDWICH PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION INCLUDES
- A. Translucent sandwich panel hurricane wall systems.
- B. Curved translucent sandwich panel wall systems.

1.2 RELATED REQUIREMENTS
- A. Metal Fabrications - Section 05500.
- B. Rough Carpentry - Section 06105.
- C. Sheet Metal Flashing and Trim – Section 07620.
- D. Joint Sealants - Section 07920.

1.3 ADMINISTRATIVE REQUIREMENTS FOR SEQUENCING
- A. Ensure that locating templates and other information required for installation of wall system(s) are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.4 SUBMITTALS
- A. Product Data: Manufacturer's data sheets on each product to be used, including preparation instructions and recommendations, storage and handling requirements, installation methods and maintenance instructions.
- B. Shop Drawings: Include plans, elevations, sections, and details, indicating dimensions, tolerances, profiles, anchorage, connections, fasteners, provisions for expansion and contraction, drainage, flashing, finish, glazing, and attachments to other Work.
- C. Samples:
  1. Submit sample sets of color chips for initial selection representing manufacturer's full range of available colors and finishes.
  2. Submit samples for verification, consisting of at least one sample, minimum 6 inches high by 12 inches wide, representing actual product (including framing) and color(s).
- D. Design Data:
  1. Submit manufacturer's structural calculations showing sizes of framing members and loads applied to supporting structure based on design loads.
  2. Submit any required signed and sealed structural calculations prepared by a qualified professional engineer who is licensed in the state where system is to be installed.
- E. Manufacturer's Certificates: Submit documentation certifying products meet or exceed specified requirements.
- F. Sustainable Design Submittals:
  1. Submit material as requested – including percentages by weight of post-

consumer/ post-industrial recycled content, locally manufactured/ harvested materials and any applicable VOC content.

G. Test Reports: Submit certified test reports from a qualified independent testing agency, indicating wall systems comply with specified requirements. Submit results from the following:
   1. Flame spread and smoke development, ASTM E 84.
   2. Burn extent, ASTM D 635.
   3. Color change, ASTM D 2244 in accordance with ASTM D 1435.
   4. Impact strength, exterior face sheets, UL 972.
   5. Accelerated aging, ASTM D 1037.
   6. Bond strength, ASTM C 297.
   7. Insulating U-factor, ASTM C 1199.
   8. Self-ignition, ASTM D 1929.
   9. Class A burning brand, ASTM E 108.
   10. Air infiltration, ASTM E 283.
   11. Water penetration, ASTM E 331.
   12. Uniform load deflection, ASTM E 72 and E 330.
   13. Concentrated and Impact, ASTM E 661.
   14. Certification authorization under the NFRC PCP (Framing and Panel).
   15. ASTM E1886/E1996 for Large Missile Impact Resistance (up to Wind Zone 3, Missile Level D)

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten years documented experience in the fabrication of wall systems of the type required for this project and capable of providing field service representation during installation.

B. Installer Qualifications: Minimum five years documented experience in the work of this section, specializing in work similar to project requirements and approved by manufacturer.

C. Quality control inspections conducted at least once each year to include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 - Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems - as issued by the ICC-ES.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and installation location.

B. Storage/Handling: Store products above the floor and under cover in a clean, dry area until installation. Protect materials and finish from damage during handling and installation.

1.7 SITE 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 recommended lim-

its.

1.8 WARRANTIES

A. Material Workmanship (select one):
   1. Provide manufacturer's optional 10 year warranty (also provide deductive alternate for 5 year).
B. Exterior Fiberglass Color Change (select unless otherwise specified):
   1. Provide manufacturer's standard 10 years.
C. Fiberglass Fiberbloom: Provide manufacturer's standard 25 year warranty.
D. Metal Finishes: (Please consult Major Industries for assistance).
   1. Anodize: Provide manufacturer's optional 10 year warranty.

PART 2 PRODUCTS

2.1 TRANSLUCENT WALL SYSTEMS

A. Guardian 275® Translucent Wall System.

2.2 DESIGN / PERFORMANCE REQUIREMENTS

A. Performance Requirements:
   1. Framing Members: Sufficient sizes as required to support design loads.
B. Deflection Limits: Shall not exceed: L/120 per IBC code requirements.
C. Safety Factors: Allowable stresses shall incorporate following safety factors, unless otherwise specified: Load Carrying Members: 1.65, Load Carrying Fasteners: 2.0.
D. Expansion and Contraction: Design and install components with provisions for expansion and contraction due to a 100 degree F (56 degrees C) temperature variation.
E. Design Loads: Framing components shall be designed to support the following loads:
   1. Live Load (Select One):
      a. As indicated on the Drawings.
   2. Wind Load (Select One):
      a. As indicated on the Drawings.
F. Windborne Debris/Impact Resistance: Provide wall systems that pass missile-impact and cyclic pressure tests according to ASTM E 1886 and ASTM E1996 for Wind (Select One): Zone 1/ Zone 2 / Zone 3.
G. Design Calculations:
   1. Prepare structural calculations in accordance with Aluminum Association Specifications for Aluminum Structures SAS30.
   2. Provide calculations prepared and stamped by a registered professional engineer, qualified in
      the design of wall systems and licensed in the state where wall systems are to be installed.

2.3 MANUFACTURERS

A. Acceptable Manufacturer: Major Industries Inc., 7120 Stewart Ave, Wausau, WI 54401;

Tel: 888-759-2678 / 715-842-4616; Fax: 715-848-3336; info@majorskylights.com.

B. Requests for substitutions considered in accordance with provisions of Section 01600.

2.4 COMPONENTS

A. Translucent Panel Units:
   1. Construction: Architectural-grade fiberglass reinforced polymer sheets bonded under controlled heat and pressure to a mechanically-interlocked aluminum I-beam grid core to form double-faced, self-supporting, structural composite sandwich panels.
      a. Thickness: Base Bid - 4 inches (101.6mm); provide deductive alternate for 2-3/4 inches (699 mm) option.
      b. Panel Maximums: 5 feet (1.52 m) wide / 16 feet (4.88m) long.
      c. U-Factor: Center of Panel U-factor (for glazing comparisons only)
         1) 2-3/4 inch:
            a) 0.48 (No Insulation).
            b) 0.20 (Insul 24).
            c) 0.17 (Insul 15).
            d) 0.08 (IMG 125).
         2) 4-inch (Optional):
            a) 0.48 (No Insulation).
            b) 0.11 (Insul 10).
            c) 0.06 (IMG 125).
      d. U-Factor: NFRC 100-2010 certified values for complete wall system (including internal grid and perimeter framing - thermally broken)
         1) 2-3/4 inch:
            a) 0.58 (No Insulation).
            b) 0.30 (Insul 24).
            c) 0.27 (Insul 15).
            d) 0.20 (IMG 125).
         2) 4-inch (Optional):
            a) 0.55 (No Insulation).
            b) 0.20 (Insul 10).
            c) 0.16 (IMG 125).
      e. Grid Pattern (Select One – Contact Major for Custom Pattern and Size Options):
         1) In-line Shoji (12 inch x 24 inch [304 mm by 610 mm] maximum grid size).
         2) Staggered Shoji (12 inch x 24 inch [304 mm by 610 mm] maximum grid size).
         3) Tuckerman (Square - 12 inch x 12 inch [304 mm by 304 mm] maximum grid size).
         4) Verti-Lite™ (vertical grid only – 12 inch x 12 inch [304 mm by 304 mm] maximum grid size. Not available on blast/hurricane systems)
      f. Unbonded Areas: Maximum of 4 unbonded areas, a maximum of

3/64 inch
(.11 mm) in diameter, in an area a maximum of 40 square feet of panel surface.

g. Panel Weeps: Weep holes provided on down slope side of installed panels to permit condensation to leave panel interior.
h. Panel Corners: Notch and interlock or reinforce with aluminum for radius conditions.
i. Assembly: Factory assembled. Field assembly of panels not allowed.

2. Physical Properties:
   a. ASTM E 108 - Burning Brand: Class A rating.
   b. ASTM E 72 and E 330 - Uniform Load Deflection.
   c. ASTM E 661 - Concentrated and Impact.
   d. ASTM E 283 - Air Infiltration through fixed panel system and perimeter framing:
      less than 0.01 cfm/ft air leakage at 6.24 psf air pressure.
   e. ASTM E 331 - Water penetration through fixed panel system and perimeter framing.
      No leakage when water is applied to entire panel surface at rate of 5 gal/hr/sq ft for 15 minutes at 12 psf air pressure.
3. I-Beam Grid Core:
   a. Material: Mechanically interlocked Aluminum Alloy 6061-T6.
   b. 7/16 inch (11 mm) minimum flange width, 0.050 inch (1.27 mm) web thickness.
   c. Full surface contact with face sheets.
   d. Thermal Break (optional): Poured and debridged structural polyurethane.
4. Adhesive:
   a. Waterproof resin for use in laminating face sheet to aluminum grid core.
   b. Impact and Thermal Shock: Adhesive capable of withstanding impact and thermal shock normally encountered in exterior construction.
   c. Adhesive Bond Line: Straight, black, cover entire width of I-beam, with neat edge.
   d. Initial Adhesive Bond Strength: Shear Strength, ASTM D 1002: 563 psi., Tensile Strength, ASTM C 297: 557 psi minimum.
   e. Aged Adhesive Bond Strength, ASTM D 1037: Shear Strength, ASTM D 1002:
      1212 psi., Tensile Strength, ASTM C 297: 914 psi.
5. Thermal Breaks (optional):
   a. Perimeter Framing System: Poured and debridged structural polyurethane.
6. Translucent Face Sheets:
   a. Appearance of Face Sheets:
      1) Uniform in color to prevent splotchy appearance.

2) Free of ridges, wrinkles, clusters of air bubbles and pinholes.

b. Exterior Face Sheet:
1) ASTM D 2244: Color change shall not exceed 3.0 Delta E units after 5 years of weathering (accelerated Arizona / simulated South Florida testing).
2) Protective Weathering Surface:
a) Application: Factory-applied.
b) Minimum Thickness: 1.0 mil.
c) Repairs: Fully field repairable.
3) Impact Strength, UL 972 / Thickness (Select One):
a) Standard - 70 foot-pounds / 0.070 inches.
b) High-impact (optional) - 360 foot-pounds / 0.070 inches.
4) Color (Select One - Consult Major for availability of Custom Colors):
a) White.
b) Crystal.
c) Ice Blue.
d) Aqua.
e) Tan.
f) Desert Rose.

c. Interior Face Sheet:
1) Flame Spread, ASTM E 84: 10 maximum.
2) Smoke Development, ASTM E 84: 300 maximum.
3) Burn Rate, ASTM D 635: 1.0 inch per minute maximum.
4) Self-Ignition, ASTM D 1929: Greater than 650 degrees F.
5) Thickness (Select One):
a) Standard - 0.045 inches.
b) High-impact - 0.060 inches (optional).
6) Color (Select One - Consult Major for availability of Custom Colors):
a) White.
b) Crystal.

B. Components and Framing:
1. Aluminum:
a. Extruded Aluminum: ASTM B 221, Alloy 6063-T5/T6, 6061-T5/T6.
b. Formed Aluminum Components and Flashing: ASTM B 209, Alloy 5005-H34.
c. Minimum Thickness: 0.040 inch.
2. Interior/Exterior Glazing Gaskets:
a. Factory installed (in extruded dovetail slots) EPDM hybrid, 9/16 inch wide.
b. Compression Deflection, 25% Deflection Limits, ASTM D 1056, 13 to 24 psi.
c. Compression Set, 22 Hours at 158 Degrees F, ASTM D 395, Method B: 30 psi.
d. Heat Aging, 70 Hours at 212 Degrees F, Change in Compression

Values, ASTM D 865 and D 1056: 0 to 10 psi.

e. Ozone Resistance at 40% Elongation, 100 Hours at 104 Degrees F, ASTM D 1149:
Type I, 1 Ppm Ozone: No cracks / Type II, 3 Ppm Ozone: No cracks.

f. Straining of Surface, ASTM D 925: Non-straining, no migratory strain.

C. Condensation Control System:
1. Mechanically design to function properly with minimal dependency upon sealants.
2. Provide an integral gutter system on all framing members.

D. Custom Designs: 3D modeling used to verify custom fitting and assembly.

E. Expansion and Contraction: Design and install components with provisions for expansion and contraction due to a 100 degree F temperature variation.

F. Glazing Caps:
1. Extruded aluminum.
2. Attach with fasteners a maximum of 12 inches on center or as required to resist negative loading.
3. Fastener covers with finish to match system framing.

G. Fasteners:
1. Clips for Attachment: Aluminum - attach using bolted fastening methods.
2. Construction and Glazing Cap Fasteners: 18-8 stainless steel - include gasketed sealing washers.
3. Field Anchors: Cadmium plated, unless otherwise specified.
4. Exposed Fasteners: Finish to match aluminum.

2.5 FABRICATION

A. Construct wall systems of extruded aluminum shapes similar to sections indicated on the Drawings.

B. Weep Holes Components: Located as required to control condensation and allow it to pass to the exterior.

2.6 ALUMINUM FINISHES

A. Anodized Coating: Architectural Class II clear anodized, Type AA-M10C22A31.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive translucent wall system with installer and manufacturer's representative present, including supporting structure and substrate for dimensions, tolerances, material conditions, and support.

B. Notify Architect of conditions that would adversely affect installation or subsequent utilization of wall system and do not proceed until conditions are corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Ensure supports to receive wall system are clean, flat, level, plumb, and square.
C. Aluminum Protection: Where aluminum will contact dissimilar materials, apply a coating of bituminous paint or other neutral material or separate with a nonabsorbent isolator.

3.3 INSTALLATION
A. Install wall systems level, plumb, square, and accurately aligned, and in accordance with manufacturer's instructions at locations indicated on the approved drawings.
B. Do not install wall system components with deficiencies or dimensional errors. Do not proceed with installation until unsatisfactory components are replaced.
C. Anchor wall system securely to supports using attachment methods that permit adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
D. Install wall system and related components as required for a complete, weatherproof installation.

3.4 FIELD QUALITY CONTROL
A. Water Test: Test wall system according to procedures in AAMA 501.2.
B. Repair or replace work that does comply with specified requirements and retest work.
C. Examine installation of sheet metal flashing and sealants.
D. Examine all face sheets for cracks, deep scratches, and other damage, and inspect protective weathering surface of exterior sheet. Repair in accordance with manufacturer's instructions.

3.5 CLEANING
A. Clean wall system inside and outside, including member connections and inside corners, immediately after installation and after sealants have cured, but not more than 10 days after installation.
B. Follow related cleaning instructions in accordance with manufacturer's recommendations.

3.6 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 08453

SECTION 08710 - DOOR HARDWARE

PART I - GENERAL

1.1 WORK INCLUDED

A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Hollow Metal Doors and Frames
B. Aluminum Doors and Frames
C. Wood Doors and Frames

1.3 DESCRIPTION OF WORK

A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.
B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.
C. Hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.
D. Fasteners:
   1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
   2. Furnish each item complete with all screws required for installation.
   3. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.
   4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).
E. Exterior openings
   1. Provide hardware for hurricane openings in compliance with local jurisdiction. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by local authority for the types and sizes of doors required, and complies with the requirements of the door and door frame. Coordinate Section (08710) Finish Hardware with the Hollow Metal Doors and Frames (08110) and Aluminum Doors and Frames (08210).

1.4 QUALITY ASSURANCE

A. The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This

person is to be available for consultation to the architect, owner and the general contractor at reasonable times during the course of work.

B. The finish hardware supplier shall prepare and submit to the architect six (6) copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.

C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.

D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.

E. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.

F. The hardware manufactures are to supply both a pre-installation class as well as a post-installation walk-thru. This is to insure proper installation and provide for any adjustments or replacements of hardware as required.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.6 WARRANTY

A. The material furnished shall be warranted for one year after installation or longer as the individual manufacturer's warranty permits.

B. The manufacturer against failure due to defective materials and workmanship shall warrant overhead door closers in writing for a period of ten (10) years. Commencing on the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. To the greatest extent possible, obtain each kind of hardware from only one manufacturer.
B. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers.

PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
1) Hinges	Ives	Stanley, Bommer
2) Locks & Latches	Schlage Locks	Falcon, Best
3) Exit Devices	Von Duprin	Falcon
4) Door Closers	LCN	Falcon
5) Wall Stops/Floor Stops, Flushbolts	Ives	Trimco
6) Kick Plates	Ives	Trimco
7) Threshold/Weather-strip	National Guard	Reese, Zero
8) Silencers	Ives	Trimco
9) Key Cabinet	Lund	Key Control

C. If material manufactured by other than that specified or listed herewith as an equal, is to be bid upon, permission must be requested from the architect seven (7) days prior to bidding. If substitution is allowed, it will be so noted by addendum.

2.2 FINISH OF HARDWARE:

A. Exterior Hinges to be Stainless Steel (32D), Interior Hinges to be Satin Chrome (26D). Door Closers to be Aluminum. Locks to be Satin Chrome (26D), Exit Devices to be Satin Chrome (26D). Overhead Holders to be Satin Chrome (26D), Flat Goods to be Satin Chrome (26D) or Stainless Steel (32D) and the Thresholds to be Mill Finish Aluminum.

2.3 HINGES AND PIVOTS:

A. Exterior butts shall be Stainless Steel. Butts on all out swinging doors shall be furnished with non-removable pins (NRP).
B. Interior butts shall be as listed.
C. Doors 5’ or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2’6” in height or fraction thereof. Dutch door shall have two (2) butts per leaf.

2.4 KEYING:

A. Equip locks and cylinders with Owners small format IC core cylinders.
B. All bittings shall be issued by lock manufacture per owners instructions.
C. Provide Two (2) each change keys per lock and Six (6) each grand master, master keys, two (2) construction and two (2) permanent control keys.

D. Hardware supplier to provide temporary cylinders or cores during the construction phase. The contractor is to change out the temporary cylinders for the permanent cylinders.

2.5 LOCKSETS:

A. Locksets shall be Heavy Duty Mortise type, unless specified otherwise, in "L" Series, Lever designs as manufactured by Schlage Lock Company.

1. Acceptable substitutions:
   A. Falcon "M"
   B. Best "45K"

2.6 EXIT DEVICES:

A. Exit devices shall be Von Duprin 98 Series in types and functions specified. All devices must be listed under "Panic Hardware" in accident equipment list of Underwriters Laboratories. All labeled doors with "Fire Exit Hardware" must have labels attached and be in strict accordance with Underwriters Laboratories.
B. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles must be provided.
C. Surface strikes shall be roller type and come complete with a plate underneath to prevent movement. And shall be provided with a dead-latching feature to prevent latch bolt tampering.
   1. Acceptable substitutions: Falcon 25

2.7 DOOR CLOSERS:

A. Closers shall be LCN 4000 and 1400 Series having non-ferrous covers, forged steel arms separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arm mounted on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.

B. Door closer cylinders shall be of high strength cast construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory.

C. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C.

D. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed,

general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage. Pressure relief valves (PRV) are not acceptable.

1. Acceptable substitutions:
   A. Falcon SC70

2.8 TRIM AND PLATES:

A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 10" high, mop plates to be 4" high. All plates shall be two (2) inches less full width of door.
B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

2.9 DOOR STOPS:

A. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives WS407 Series are preferred, but where not practical furnish floor stops equal to Ives FS436 or FS438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 Series.

2.10 THRESHOLDS AND WEATHERSTRIP:

A. Thresholds and weather-strip shall be as listed in the hardware schedule.

2.11 DOOR SILENCERS:

A. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.

B. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

C. No hardware is to be installed until the hardware manufactures have provided a pre-installation class to insure proper installation of the specified products. A post installation inspection by a manufacturer's representative will be provided to insure proper installation.

3.2 ADJUSTING AND CLEANING:

A. Contractor shall adjust all hardware in strict compliance with manufacturer's instructions. Prior to turning project to owner, contractor shall clean and make any final adjustments to the finish hardware.

3.3 PROTECTION:

A. Contractor shall protect the hardware, as it is stored on construction site in a covered and dry place.

B. Contractor shall protect exposed hardware installed on doors during the construction phase.

3.4 KEY CABINET:

A. Set up and index one (1) Key Cabinet that allows room for expansion for 150% of the number of keys for the project.

3.5 HARDWARE SCHEDULE:

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.

Hardware Group No. 01

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	HH-9847-NL-OP-110MD-SNB	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH

1	EA	LONG DOOR PULL	9264 72" 56" STD	630	IVE
1	EA	SURFACE CLOSER	4021 DEL	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	THRESHOLD	65A MSLA-10	AL	ZER

Balance of Door Hardware to be supplied by Aluminum Door Supplier 084100

Hardware Group No. 02

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	SURFACE BOLT	SB360 12" T	604	IVE
1	EA	STOREROOM W/DEADBOLT	L9480BDC 06A L583-363	626	SCH
2	EA	SURFACE CLOSER	1461 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	188S	BLK	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER

Metal Z-Astragal by Metal Door Supplier

Hardware Group No. 03

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	HH-98-NL	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	SURFACE CLOSER	1461 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	188S	BLK	ZER
1	EA	THRESHOLD	65A MSLA-10	AL	ZER

Hardware Group No. 04

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	LONG DOOR PULL	9264 72" 56" STD	630	IVE
1	EA	SURFACE CLOSER	4021 DEL	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE

Balance of Door Hardware to be supplied by Aluminum Door Supplier 084100

Hardware Group No. 05

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	L9070BDC 06A	626	SCH
1	EA	SURFACE CLOSER	1461 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 06

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080BDC 06A	626	SCH
1	EA	SURFACE CLOSER	1461 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 07

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056BDC 06A L283-722	626	SCH
1	EA	SURFACE CLOSER	1461 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 08

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5PB1 4.5 X 4.5	652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056BDC 06A	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 09

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	ENTRANCE LOCK	ND53BDCD RHO	626	SCH

BALANCE OF HARDWARE IS EXISTING TO REMAIN

END OF SECTION 08710

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SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and 12-inch- (300-mm-) square Samples.

B. Fire-Resistance-Rated Assemblies: Products identical to those tested per NFPA 252 for doors and NFPA 257 for window assemblies; both labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

D. Comply with written instructions of glass product manufacturers; GANA's "Glazing Manual;" and publications of GANA, AAMA, and SIGMA as applicable to products indicated, unless more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 GLASS

A. Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), and Quality q3.

B. Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated), Type I, Class 1 (clear), Quality q3, Kind HS (heat strengthened).

C. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass in indicated.

D. Monolithic Float Glass Units
Uncoated Clear Float Glass Units: 6.0 mm thick, Class 1 (clear) Kind FT (fully tempered) float glass.

2.2 FABRICATED GLASS PRODUCTS

A. Laminated-Impact Resistant Glass (all exterior glazing): Kind LA consisting of two sheets of 6.0 mm thick, Type I, Class 1 (clear) annealed float glass with 0.090 inch clear polyvinyl butyryl sheet interlayer. Comply with ASTM C 1172.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are contained in GANA's "Glazing Manual."

B. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

END OF SECTION 08800

SECTION 08830 – MIRRORS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Safety Glass: Category II materials per 16 CFR 1201.

1.2 WARRANTY

A. Warranty: Five years.

1.3 PRODUCTS

A. Glass Mirrors: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Clear Glass: Nominal thickness of 4.0 mm Ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.

C. Tinted Glass: Nominal thickness of 4.0 mm.

D. Tempered Clear Glass: Nominal thickness of 4.0 mm.

E. Laminated Mirror Clear Glass for Outer Lite: Nominal thickness of 4.0 mm Ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.]

F. Laminated Mirror Clear Glass for Inner Lite: Nominal thickness of 4.0 mm tempered.

G. Film backing for safety mirrors.

H. Miscellaneous Materials: Setting blocks and Mirror mastic.

I. Mirror Hardware: Bottom aluminum J-channels and Mirror clips.

J. Mirror Edges: Flat polished.

END OF SECTION 08830

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SECTION 09111 - NON-LOAD BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: As indicated on drawings but in no case less than 2 inches (51 mm)].

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
2. Steel Studs: ASTM C 645.

   a. Minimum Base-Metal Thickness: [0.0312 inch (0.79 mm).
   b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

   a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

4. Resilient Furring Channels: 1-1/2-inch- (38.2-mm-) deep members designed to reduce sound transmission.

   a. Configuration: Hat shaped.

E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Armstrong World Industries, Inc.; Drywall Grid Systems.
   b. Chicago Metallic Corporation; Drywall Furring System.
   c. USG Corporation; Drywall Suspension System.
   d. Or approved equal

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed

with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

   a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

   1. Minimum Base-Metal Thickness: 0.027 inch (0.7 mm).

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

   1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
   2. Depth: 1-1/2 inches (38.1 mm).

E. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.

   1. Configuration: Hat shaped.

F. Cold-Rolled Furring Channels:

   1. Depth: 3/4 inch (19.1 mm).
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

2.4 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING SUSPENSION SYSTEMS

A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

B. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacing's that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Do not attach hangers to gypsum roof deck.

4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

C. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb, unless otherwise indicated.
   b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.

C. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

D. Z-Furring Members:

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced [24 inches (610 mm)] [600 mm] o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 09111

SECTION 09220 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and finish Samples.

B. STC-Rated Assemblies: Provide materials and construction identical to assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to assemblies tested according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 METAL FRAMING AND SUPPORTS

A. Ceiling Support Components: Comply with ASTM C 1063.

1. Wire for Hangers and Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Rod Hangers and Flat Hangers: Mild steel, zinc coated.
3. Cold-Rolled Steel Carrying Channels: Minimum 0.0598-inch- (1.5-mm-) thick base (uncoated) metal, 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (0.7 kg/m), and 7/16-inch- (11.1-mm-) wide flanges, with hot-dip galvanized finish, ASTM A 653/A 653M, G60 (Z180).
4. Cold-Rolled Steel Furring Channels: Minimum 0.0598-inch- (1.5-mm-) thick base (uncoated) metal, 3/4 inch (19 mm) deep, 300 lb/1000 feet (0.45 kg/m), and 7/16-inch- (11.1-mm-) wide flanges, with hot-dip galvanized finish, ASTM A 653/A 653M, G60 (Z180).
5. Studs for Furring Channels: ASTM C 645, in depth indicated, minimum 0.0179-inch- (0.455-mm-) thick base (uncoated) metal, with ASTM A 653/A 653M, G40 (Z90) hot-dip galvanized coating.

B. Non-Load-Bearing Studs and Runners: ASTM C 645 with ASTM A 653/A 653M, G40 (Z90) hot-dip galvanized coating. Minimum 0.0179-inch- (0.455-mm-) thick base (uncoated) metal for studs and minimum 0.0329-inch- (0.836-mm-) thick base (uncoated) metal for head and sill runners, and jamb and cripple studs at openings.

C. Load-Bearing Studs and Runners: ASTM C 955 with ASTM A 653/A 653M, G40 (Z90) hot-dip galvanized coating. Grade 33 (Grade 230) for thickness of 0.0329 inch (0.836 mm) or less.

D. Vertical Metal Furring: Complying with the following:

1. Channel Furring and Braces: Cold-rolled steel, minimum 0.0598-inch- (1.5-mm-) thick base (uncoated) metal and 3/4-inch- (19-mm-) deep-by-7/16-inch- (11.1-mm-) wide flanges, 300 lb/1000 feet (0.45 kg/m).
2. Hat Channels: Hat-shaped screwable furring channels, 7/8 inch (22.2 mm) deep, formed from zinc-coated (galvanized) steel sheet, minimum 0.0179 inch (0.455 mm) thick, Grade 33.
3. Z-Furring Members: Screw-type, Z-shaped furring members formed from minimum 0.0179-inch- (0.455-mm-) thick, zinc-coated (galvanized) steel sheet.
4. Furring Brackets: Serrated-arm type, minimum 0.0329-inch- (0.836-mm-) thick base (uncoated) metal, adjustable from 1/4- to 2-1/4-inch (6- to 57-mm) wall clearance for channel furring.
5. Protective Coating: ASTM A 653/A 653M, G40 (Z90) hot-dip galvanized coating.

2.2 LATH

A. Expanded-Metal Lath: ASTM C 847, diamond mesh, flat or self-furring configuration as indicated, and with minimum 3.4-lb/sq. yd. (1.8-kg/sq. m) weight.

B. Rib Lath: ASTM C 847, flat, rib depth of not more than 3/8 inch (9.5 mm) with minimum 3.4-lb/sq. yd. (1.8-kg/sq. m) weight.

C. Woven-Wire Lath: ASTM C 1032, fabricated into 1-1/2-inch (38-mm) hexagonal-shaped mesh with minimum 0.0510-inch- (1.3-mm-) diameter, galvanized steel wire.

D. Welded-Wire Lath: ASTM C 933, fabricated into 2-by-2-inch (50-by-50-mm) openings with minimum 0.0625-inch- (1.6-mm-) diameter, galvanized steel wire.

E. Paper Backing: Asphalt-impregnated paper complying with FS UU-B-790, Type I, Grade D (vapor permeable), Style 2, and factory bonded to back of lath.

2.3 ACCESSORIES

A. Comply with material provisions of ASTM C 1063 and the requirements indicated below; coordinate depth of accessories with thicknesses and number of plaster coats required.

1. Aluminum Components: ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5 or aluminum extrusions with similar properties.
2. Galvanized Steel Components: Fabricated from zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G40 (Z90) minimum coating designation.
3. Zinc-Alloy Components: ASTM B 69, 99 percent pure zinc.
4. Plastic Components: ASTM D 4216, high-impact PVC for building products.

B. Bonding Agent: ASTM C 932.

C. Sound Attenuation Blankets: ASTM C 665 for Type I (mineral-fiber blankets without membrane facing).

2.4 PORTLAND CEMENT PLASTER

A. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminates, manufactured for use in portland cement plaster.

B. Lime: ASTM C 206, Type S; ASTM C 207, Type S.

C. Base-Coat Cements: Portland cement, ASTM C 150, Type I

D. Base-Coat Aggregate: Sand, ASTM C 897.

E. Job-Mixed Finish Coat: Comply with ASTM C 926.

1. Portland cement, ASTM C 150, Type I
2. Manufactured or natural sand, ASTM C 897, in color required to produce plaster of color selected.

F. Factory-Mixed Stucco Finish Coat: Formulation of portland cement, aggregate, coloring agent, and other proprietary ingredients.

G. Factory-Mixed Acrylic-Based Finish Coat: Formulation of acrylic emulsion, colorfast mineral pigments, and fine aggregates specifically recommended by acrylic-based finish manufacturer for use over portland cement plaster base coats.

H. Factory-Mixed Finish Coat: Formulation of portland cement, lime, aggregate, and coloring agent, compatible with base coat and finish texture indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install furring and lathing materials to comply with ASTM C 1063 and ML/SFA 920, "Guide Specification for Metal Lathing and Furring."

1. Comply with ASTM C 754 for installing non-load-bearing stud systems.
2. Comply with ASTM C 1007 for installing load-bearing stud systems.

B. Install supplementary framing, blocking, and bracing at terminations in Work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work.

C. Locate control joints at natural lines of weakness to prevent cracking. Control joints in fire-resistance-related construction require rated joint systems and special detailing. ASTM C 1063 requires control joints to be located as follows:

1. Delineate plasterwork into areas (panels) of the following maximum sizes:
   a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
   b. Horizontal and Other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
   c. At distances between control joints of not more than 18 feet (5.5 m) o.c.
   d. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   e. Where control joints occur in the surface of construction directly behind plaster.
   f. Where plastered ceiling framing or furring changes direction.
   g. Where plasterwork areas change dimensions control joints should be located to delineate rectangular-shapes areas (panels) to relieve the stress that occurs at the corner formed by the dimension change.

D. Proportion, mix, apply, and cure plaster materials and finishes to comply with ASTM C 926. Apply three coats. Apply sand float finish coat.

E. STC-Rated Assemblies: Comply with ASTM C 919 for location of edge trim and closing off sound-flanking paths around or through assemblies.

END OF SECTION 09220

SECTION 09232 - ACOUSTICAL TILE CEILINGS

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 acoustical tiles for ceilings and the following:
   1. Concealed suspension systems.
   2. Direct attachment of tiles to substrates with adhesive.
   3. Direct attachment of tiles to substrates with staples.

B. Related Sections include the following:

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data.

C. Research/Evaluation Reports: For acoustical tile ceiling and components and anchor type.

D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 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.
   2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Products: Provide one of the products specified:

a. Tile:
   1) Armstrong: "Fine Fissured", RH90, #1729
   2) Celotex: Vantage 10
   3) U.S.G.: Radar Cuma Plus, #2410
b. Suspended Grid
   1) Armstrong: "Prelure, Hot Dipped"
   2) Celotex: "Celogrid 900 System, Hot Dipped"
   3) U.S.G.: DX2 24 Glav. Grid
   4) Caicagometallic: 211-01H, 1210-01H, 1226-01H, 1420-01

2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

C. Coating-Based Antimicrobial Treatment: Provide acoustical tiles with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273.

D. Tile-Based Antimicrobial Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial solution that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.

2.3 NODULAR, MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

A. Color: White.

2.4 WATER-FELTED, MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

A. Classification: Provide tiles complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted.
   1. Pattern: As indicated by manufacturer's designation.

B. Color: White.

C. LR: Not less than 0.80.

D. NRC: Not less than 0.50.

E. CAC: Not less than 35.

F. Edge Detail: Square Lay-In.

G. Thickness: Not less than 5/8 inch (15 mm).

H. Size: As indicated on Drawings.

I. Antimicrobial Treatment: Panel based.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Cast-in-place anchors.
      b. Type: Postinstalled expansion anchors.
      c. Type: Postinstalled adhesive anchors.
      d. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
      e. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchors.
   2. 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: Provide wires complying with the following requirements:
   1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. 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. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

2.6 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytic zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.
   1. Structural Classification: Intermediate-duty system.
   2. Access: Upward and end or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

      a. Initial Access Opening: In each module, as indicated on Drawings.

B. Indirect-Hung Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.
   1. Structural Classification: Intermediate-duty system.
   2. Carrying Channels: Cold-rolled steel, 0.059850-inch- (1.52-mm-) minimum base (uncoated) metal thickness, not less than 3/16-inch- (4.7-mm-) wide flanges by 1-1/2-inch- (38-mm-) deep steel channels, 475 lb/1000 feet (0.707 kg/m), with rust-inhibitive paint finish.

3. Access: Where access is indicated, provide special cross runners or split splines to allow for removal of acoustical units in indicated access areas. Identify access tile with manufacturer's standard unobtrusive markers for each access unit.

2.7 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers:
   1. Armstrong World Industries, Inc.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc.

B. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
   1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:
   1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.
   2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
   3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).
   4. Conversion-Coated and Factory-Primed Finish: AA-M12C42R1x (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating; Organic coating as follows):
      a. Manufacturer's standard factory-applied prime-coat finish ready for field painting.

   5. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

6. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
   a. Organic Coating: Thermosetting, enamel primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).

2.8 ACOUSTICAL SEALANT

A. Products:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

   2. Acoustical Sealant for Concealed Joints:
      a. OSI Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
      b. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
      c. Pecora Corp.; BA-98.
      d. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.9 MISCELLANEOUS MATERIALS

A. Tile Adhesive: Type recommended by tile manufacturer, bearing UL label for Class 0-25 flame spread.

B. Staples: 5/16-inch- (8-mm-) long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. 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.

4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate 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.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:
   1. As indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
   1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
   2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.
   3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 INSTALLATION, DIRECTLY ATTACHED ACOUSTICAL TILE CEILINGS

A. Adhesive Installation: Install acoustical tile by bonding to substrate, using amount of adhesive and procedure recommended in writing by tile manufacturer and as follows:

   1. Remove loose dust from backs of tiles by brushing and prime them with a thin coat of adhesive.
   2. Install splines in joints between tiles; maintain level of bottom surface of tiles to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m) and not exceeding 1/4 inch (6.35 mm) cumulatively.
   3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

B. Stapled Installation: Fasten acoustical tile to substrate using a minimum of two staples per tile that are installed in flanges of tile and as follows:
   1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
   2. Maintain level of bottom surface of tiles to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m) and not exceeding 1/4 inch (6.35 mm) cumulatively. Shim tile or correct substrate as required to maintain tolerance.

3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

D. Arrange directionally patterned acoustical tiles as follows:
1. As indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to long axis of space.
3. Install tiles with pattern running in one direction parallel to short axis of space.
4. Install tiles in a basket-weave pattern.

3.5 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09232

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SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Tile backing panels.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying 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. Only manufacturers located within the continental United States or Canada are acceptable.

1. 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:

a. National Gypsum Company.
b. USG Corporation.
c. Other approved equal
d.

B. Regular Type:

1. Thickness: 5/8 inch or as indicated on drawings.
2. Long Edges: Tapered.

C. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

2.2 TILE BACKING PANELS

A. Cementitious Backer Board Installation:
1. Install as indicated to comply with ANSI A108.11 and in accordance with manufacturer's instructions.
2. Complete plumbing rough in before boards are erected.
3. Separate board from rough in and fixtures and fill space as recommended by manufacturer.
4. Securely fasten boards to substrate as required.
5. Follow manufacturer's instructions for treatment of edge terminations.
6. At joints and corners, embed fiberglass tape in skim coat of mortar.]

B. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. G-P Gypsum.
b. National Gypsum Company.
c. USG Corporation.

d. Or an approved equal manufactured in Canada or the continental United States.

2. Core: 5/8 inch

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. Expansion (control) joint.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backing Board: Use appropriate mortar compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

3.2 APPLYING TILE BACKING PANELS

A. Cementitious Backing Board: Install at showers, tubs, and where indicated. Install with 1/8-inch gap where panels abut other construction or penetrations.

B. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings
4. Level 4: At all panel surfaces that will be exposed to view, unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

5. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.5 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

SECTION 09300 – TILE & GROUT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Ceramic mosaic tile.
2. Stone thresholds installed as part of tile installations.
3. Waterproof membrane for thin-set tile installations.
4. Crack-suppression membrane for thin-set tile installations.
5. Cementitious backer units installed as part of tile installations.
6. Metal edge strips installed as part of tile installations.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.

C. 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.
3. Stone thresholds in 6-inch (150-mm) lengths.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. Available Manufacturers:

1. American Marazzi Tile, Inc.
2. American Olean; Div. of Dal-Tile International Corp.
3. Buchtal Corporation USA.
4. Cerim-Floor Gres Ceramiche.
5. Crossville Ceramics Company, L.P.
6. Daltile; Div. of Dal-Tile International Inc.

7. Florida Tile Industries, Inc.
8. GranitiFiandre.
9. Interceramic.
10. KPT, Inc.
11. Laufen USA.
12. Lone Star Ceramics Company.
13. Metropolitan Ceramics.
14. Monarch Tile, Inc.
15. Porcelanite, Inc.
16. Quarry Tile Company.
17. Seneca Tiles, Inc.
18. Summitville Tiles, Inc.
19. United States Ceramic Tile Company.
20. Winburn Tile Manufacturing Company.
21. <Insert manufacturer's name.>

B. 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.

C. Unglazed Ceramic Mosaic Tile [PT-<#>]: Factory-mounted flat tile as follows:

1. Composition: Porcelain.
2. Surface: Slip-resistant, with abrasive admixture.
3. Module Size: 8 by 8 inch, (203 by 203 mm)
4. Nominal Thickness: 1/4 inch (6.35 mm).
5. Face: Plain with cushion edges.
6. Basis-of-Design: See Room Finish Material Legend. Or provide a comparable product from one of the manufacturers listed above.

D. Glazed Ceramic Tile [CT-<#>]: Factory-mounted flat tile as follows:

1. Composition: Vitreous or impervious natural clay.
2. Module Size: As indicated in the Room Finish Material Legend and the drawings.
3. Thickness: 1/4 inch (6.35 mm).
4. Face: Plain with cushion edges.
5. Finish: Bright, opaque glaze.
6. Retain Basis-of-Design: See Room Finish Material Legend. Or provide a comparable product from one of the manufacturers listed above.

E. Glazed Wall Tile [CT-<#>]: Flat tile as follows:
1. Module Size: 4-1/4 by 4-1/4 inches (108 by 108 mm) As indicated in the Room Finish Material Legend and the drawings.
2. Thickness: 5/16 inch (8 mm).
3. Face: Plain with modified square edges or cushion edges.
4. Finish: Bright, opaque glaze.

5. Basis-of-Design: See Room Finish Material Legend. Or provide a comparable product from one of the manufacturers listed above.

F. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.
1. Base: Coved, module size 4-1/4 by 4-1/4 inches (108 by 108 mm.
2. Wainscot Cap: Surface bullnose, module size 4-1/4 by 4-1/4 inches (108 by 108 mm.
3. External Corners: Double Surface bullnose.
4. Internal Corners: Field-butted square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.

G. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated, in color and finish to match adjoining wall tile, and intended for installing by same method as adjoining wall tile.

1. One soap holder with grab handle for each shower and/or tub indicated.

2.2 ACCESSORY MATERIALS

A. Thresholds: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.

1. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of [10] [12] per ASTM C 1353 or ASTM C 241 and with honed finish.

a. Description: Uniform, fine- to medium-grained white stone with gray veining.

B. Waterproofing and Crack-Suppression Membranes for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10.

1. Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric, 0.030-inch (0.76-mm) nominal thickness.

a. Product: Noble Company (The); Nobleseal TS.
b. Or approved equal

2. Latex-Portland Cement Product: Flexible mortar with acrylic-latex additive.

a. Products:

1) Boiardi Products Corporation; Elastiment 323.
2) MAPEI Corporation; PRP 315.

3) Southern Grouts & Mortars, Inc.; Southcrete 1100.
4) TEC Specialty Products Inc.; TA-324, Triple Flex.
5) Or approved equal

3. Urethane Waterproofing and Tile-Setting Adhesive: One-part liquid-applied urethane.

a. Products:

1) Bostik; Hydroment Ultra-Set.
2) Southern Grouts & Mortars, Inc.; Deck-Seal 1000.
3) Or approved equal

2.3 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Boiardi Products Corporation.
3. Bonsal, W. R., Company.
4. Bostik.
5. C-Cure.
6. Custom Building Products.
7. DAP, Inc.
8. Jamo Inc.
9. LATICRETE International Inc.
10. MAPEI Corporation.
11. Southern Grouts & Mortars, Inc.
12. Summitville Tiles, Inc.
13. TEC Specialty Products Inc.

B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

C. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. For wall applications, provide nonsagging mortar.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. For wall applications, provide nonsagging mortar.

E. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.

F. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.

G. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.

2.4 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. One-Part, Mildew-Resistant Silicone: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for in-service exposures of high humidity and extreme temperatures.

a. Products:

1) Dow Corning Corporation; Dow Corning 786.
2) GE Silicones; Sanitary 1700.
3) Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
4) Tremco, Inc.; Tremsil 600 White.

2. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

a. Products:

1) Bostik; Chem-Calk 550.
2) Mameco International, Inc.; Vulkem 245.
3) Pecora Corporation; NR-200 Urexpan.
4) Tremco, Inc.; THC-900.

B. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: Manufacturer's standard thickness, but not less than 1/4 inch (6.4 mm).

2. Products:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
d. USG Corporation; DUROCK Cement Board.

C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.

D. Metal Edge Strips: Angle or L-shape, half-hard brass or stainless steel; ASTM A 666, 300 Series exposed-edge material.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

E. 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.

3.2 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.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. 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.

D. 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.

E. 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.

F. Lay out tile wainscots to next full tile beyond dimensions 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. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11.

J. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

K. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
1. Tile floors in wet areas.
2. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
3. Tile floors composed of rib-backed tiles.

L. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Porcelain Tile: 1/8 inch (3.2 mm).

M. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

N. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

O. Install tile on walls with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Glazed Wall Tile: 1/16 inch (1.6 mm).

P. Apply grout sealer to [cementitious] grout joints in tile floors 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.

3.3 FLOOR TILE INSTALLATION SCHEDULE

A. Interior floor installation on concrete; cement mortar bed (thickset) [with cleavage membrane; TCA F111] [bonded to concrete; TCA F112].

1. Bond Coat/Thin-Set Mortar: [Dry-set] [Latex-] portland cement mortar.
2. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

B. Interior floor installation on concrete; thin-set mortar; TCA F113.

1. Thin-Set Mortar: [Dry-set] [Latex-] portland cement mortar.
2. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

C. Interior floor installation on concrete; [organic] [water-cleanable epoxy] adhesive; TCA F116.

1. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

D. Interior floor installation on [waterproof] [crack-suppression] membrane over [concrete] [and] [wood]; cement mortar bed (thickset); TCA F121.

1. Bond Coat/Thin-Set Mortar: [Dry-set] [Latex-] portland cement mortar.
2. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

E. Interior floor installation on [waterproof] [crack-suppression] membrane over concrete; thin-set mortar; TCA F122.

1. Thin-Set Mortar: Latex-portland cement mortar.
2. Grout: Polymer-modified [sanded] [unsanded] grout.

F. Interior floor installation on wood; cement mortar bed (thickset) with cleavage membrane; TCA F141.

1. Bond Coat/Thin-Set Mortar: [Dry-set] [Latex-] portland cement mortar.
2. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

G. Interior floor installation on wood; organic adhesive; TCA F142.

1. Grout: [Polymer-modified sanded grout] [Polymer-modified unsanded grout] [Chemical-resistant, water-cleanable, tile-setting and -grouting epoxy].

H. Interior floor installation on wood; chemical-resistant, water-cleanable tile-setting and -grouting epoxy; TCA F143.

I. Interior floor installation on cementitious backer units over wood; thin-set mortar; TCA F144.

1. Thin-Set Mortar: [Dry-set] [Latex-] portland cement mortar.
2. Grout: [Sand-portland cement] [Standard sanded cement] [Standard unsanded cement] [Polymer-modified sanded] [Polymer-modified unsanded] grout.

3.4 WALL TILE INSTALLATION SCHEDULE

A. See Room Finish Material Legend in drawings.

B. Interior wall installation over masonry or concrete; cement mortar bed (thickset) bonded to substrate; TCA W211.

1. Bond Coat/Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: Polymer-modified sanded grout.

C. Interior wall installation; thin-set mortar; over cementitious backer units; TCA W244.

1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: Polymer-modified sanded grout.

D. Interior bathtub wall installation; thin-set mortar; over cementitious backer units; TCA B412.

1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: Polymer-modified sanded grout.

END OF SECTION 09300

SECTION 09651 - RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

2. Rubber floor tile.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples:
1. for Initial Selection: For each type of floor tile indicated.
2. for Verification: Full-size units of each color and pattern of floor tile required.
3. Seam Samples: For seamless-installation technique indicated and for each flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm Sample applied to a rigid backing and prepared by Installer for this Project.

G. Product Schedule: For floor tile.

H. Qualification Data: For qualified Installer.

I. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain ambient 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. Until Substantial Completion, maintain ambient 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. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE

A. Products: Subject to compliance with requirements, provide the following

   1. See Room Finish Material Legend in drawings.

B. Tile Standard: Comply w/ ASTM F 1066, ASTM E 648, and ASTM E 662

C. Thickness: 0.120 inch (3.0 mm)

D. Size: 12 by 12 inches (152 by 914 mm)]

E. Seaming Method: Standard

F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Rubber Floor Adhesives: Not more than 60 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer and apply after construction cleaning is complete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions 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. 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.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer [and as follows]. Proceed with installation only after substrates pass testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor 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

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain running in one direction

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door 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 floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor 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.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile 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.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor tile surfaces before applying liquid floor polish.

E. Cover floor tile until Substantial Completion.

END OF SECTION 09651

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SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

2. Rubber floor tile.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cut-outs.

1. Show details of special patterns.

C. Samples:

1. For each type of product indicated, in manufacturer's standard-size provide samples not less than 12 inches long, of each resilient product color, texture, and pattern required.

PART 2 PRODUCTS

2.1 GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
3. Johnsonite.

B. Standards:
1. Resilient Base Standard: ASTM F 1861.
2. Material Requirement: Type TV (vinyl, thermoplastic).
3. Manufacturing Method: Group I (solid, homogeneous).
4. Style: Cove (base with toe).
5. Minimum Thickness: 0.125 inch.

2.2 RESILIENT BASE & MOULDING ACCESSORIES:

A. Material Requirement: Vinyl.
B. Style: Cove.
C. Minimum Thickness: 0.125 inch (3.2 mm)] [.
D. Height: 4 inches.
E. Outside Corners: Preformed.
F. Inside Corners: Preformed.

2.3 RESILIENT MOULDING ACCESSORIES

A. Material: Vinyl
B. Cap for cove resilient floor covering.
C. Carpet bar for tackless installations.
D. Carpet edge for glue-down applications.
E. Nosing for carpet.
F. Nosing for resilient floor covering.
G. Reducer strip for resilient floor covering.
H. Joiner for tile and carpet.
I. Transition strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products. Install resilient products after other finishing operations, including painting, have been completed.

B. Concrete Substrates: Prepare according to ASTM F 710. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

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.

3.3 INSTALLATION GENERAL

A. Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

D. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

E. 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. in 24 hours.

F. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

G. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

H. Do not install resilient products until they are same temperature as the space where they are to be installed.

I. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

J. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

END OF SECTION 09653

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SECTION 09910 - PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

1.02 SUBMITTALS

A. Product Data: Provide data on all finishing products, including MSDS sheets.

B. Manufacturer's Instructions: Indicate special surface preparation procedures.

C. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. When applying paint provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers: Paint shall be latex base as manufactured by
   a. Dulux,
   b. Sherwin Williams,
   c. Pittsburgh,
   d. Dunn-Edwards,
   e. Kelly Moore
   f. Benjamin Moore
   g. Other approved equal

B. Paving Paint: Paint used for parking stall striping shall be Sherwin-Williams Promar Traffic Marking Paint, B29W1; No. 1650 A9 Zonelac as manufactured by J. E. Bauer, or approved equal.

2.02 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Semi-gloss: Two coats of latex enamel.

B. Wood, Transparent, Varnish, No Stain:
   1. One coat sealer.
   2. Satin: One coat of varnish.

C. Concrete Masonry Units, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Semi-gloss: Two coats of latex enamel.

D. Ferrous Metals, Unprimed, Latex, 3 Coat system
   1. One coat of latex primer.
   2. Semi-gloss: Two coats of latex enamel.

E. Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanized primer.
   2. Semi-gloss: Two coats of latex enamel.

F. Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of alkyd primer sealer, or PVA sealer (Poly Vinyl Acetate).
   2. Semi-gloss: Two coats of latex enamel.

2.03 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces for finishing.

B. Surfaces: Correct defects and clean surfaces, which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

C. Marks: Seal with shellac those, which may bleed through surface finishes.

D. Gypsum Board Surfaces to be painted: Fill minor defects with filler compound. Spot prime defects after repair.

E. Plaster Surfaces to be painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

F. Concrete Floors to be painted: Remove contamination, acid etches, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

G. Galvanized Surfaces to be painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

H. Uncoated Steel and Iron Surfaces to be painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

I. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

J. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 CLEANING

A. Collect waste material, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 SCHEDULE - COLORS

A. COLORS
   1. Exterior Color No. & Name: As shown in the Exterior Finish Materials Legend in the drawings.

   2. Interior Color No. & Name: See Room Finish Materials Legend in drawings.

END OF SECTION 09910

SECTION 10431 – INTERIOR SIGNS

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. Panel signs.
2. Signage accessories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, and braille layout.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Chapter 11 of the Florida Building Code and with code provisions as adopted by authorities having jurisdiction.

1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:

a. Illuminated Exit Signs: Refer to Division 16.
b. Room Capacity: To read, “MAXIMUM OCCUPANCY = ____”

c. Signs for Accessible Spaces: Handicapped symbol signs.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PANEL SIGNS

A. Manufacturers:
1. Allenite Signs; Allen Marking Products, Inc.
2. American Graphics Inc.
3. Andco Industries Corp.
4. APCO Graphics, Inc.
5. ASI Sign Systems, Inc.
6. Best Manufacturing Co.
7. Grimco, Inc.
8. Innerface Sign Systems, Inc.
9. Kaltech Industries Group, Inc.
10. Mills Manufacturing, Inc.

11. Mohawk Sign Systems.
12. Seton Identification Products.
13. Signature Signs, Inc.
14. Supersine Company (The).

B. Use laminate with chemically welded one piece plastic type. Manufacturer's standard.

C. Graphic Content and Style: Provide sign copy that complies with requirements of the specifications and matches the existing in size, content, mounting height, and locations.

D. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

E. Applied Copy: 3 mils minimum.

F. Colored Coatings for Acrylic Sheet: For copy color, White, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

G. Signs dimensions: Signs shall be 4” x 10”.

2.3 PANEL SIGN TYPES

A. Room Signs:
1. Copy: Tactile and braille Surface.
2. Character Style: Helvetica.
3. Text: As indicated in the Specification.
4. Sizes:
   a. Sign: As required.
   b. Character: Minimum 1-inch- (25-mm-) high characters.
5. Colors: To be chosen by Architect from manufacturer’s line.

B. Occupancy Signs:
1. Perimeter: No frame.
2. Copy: RaisedSurface.
3. Character Style: Helvetica.
4. Text: As indicated in the Specification or manufacturer’s standard.
5. Sizes:

a. Sign: As required.
b. Character: Minimum 1-inch- (25-mm-) high characters.

6. Colors: To match existing signage.

C. Toilet Room Signs:
1. Perimeter: No frame.
2. Copy: Raised.
3. Character Style: Helvetica.
4. Text: As indicated in the Specification or manufacturer's standard.
5. Message: Fixed.
6. Sizes:
a. Sign: As required.
b. Character: Minimum 1-inch- (25-mm-) high characters.
7. Colors: To match existing signage.
8. Symbols of Accessibility: Provide 6-inch- (150-mm-) high symbol, raised text, 0.0035-inch (0.089-mm) nominal thickness.

2.4 ACCESSORIES

A. Mounting Methods: Use concealed fasteners, double-sided vinyl tape, or silicone adhesive fabricated from materials that are not corrosive to sign material and mounting surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

3.3 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
   2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls or head of door frame. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
   3. Provide signs for each room, at each entrance. The Room Number Schedule shall be provided by the Owner indicating the number to be identified on the sign.
   4. The following rooms shall receive a room name sign in addition to a room number sign. Install a room name sign for each entrance:
      a. MEETING AREA
      b. STORAGE
      c. ADA RESTROOM
      d. CLUBS & ORGANIZATIONS (3)
   5. Install handicapped symbol signs.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
   2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.4 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.5 SIGN SCHEDULE

A. To be provided by manufacturer.

END OF SECTION 10431

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SECTION 10520 - FIRE-PROTECTION SPECIALTIES

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. Fire-protection cabinets for the following:

      a. Portable fire extinguishers.

B. Owner-Furnished Material: Fire extinguishers.

C. Related Sections include the following:
   1. Division 10 Section "Signs" for directional signage to out-of-sight fire

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

   1. Fire Extinguishers: Include rating and classification.
   2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

   1. Sheet: ASTM B 209 (ASTM B 209M).
   2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, 3 mm thick.

E. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear)

F. Break Glass: Clear float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.

G. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

H. Wire Glass: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.

I. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, 3 mm thick, double strength.

J. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), [1.5] [3] [6] mm thick, with Finish 1 (smooth or polished).

K. Acrylic Bubble: One piece.

FIRE-PROTECTION CABINET: Refer to the Fire-Protection Cabinets Table at the end of the Evaluations for a list of manufacturers' products. Use the table in combination with manufacturers' catalog or product data to insert series, type, model, and designations of other characteristics.

L. Basis-of-Design Product: Academy Model 1025D10, J.L Industries, Inc.

M. Cabinet Construction: Nonrated.

N. Cabinet Material: Brushed Aluminum sheet.

O. Semi recessed Cabinet: Cabinet box partially recessed in walls of shallow 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).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
2. Rolled-Edge Trim: [4-inch (102-mm) backbend depth.

P. Door Material: Aluminum sheet

Q. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER”

1) Location: Applied to cabinet door.
2) Application Process: Decals.
3) Lettering Color: White.
4) Orientation: Vertical.

3. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

R. Finishes:

1. Manufacturer's standard brushed aluminum for the following:

a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2.3 MOUNTING BRACKETS

A. Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Larsen's Manufacturing Company.
9. Potter Roemer; Div. of Smith Industries, Inc.

B. 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 baked-enamel finish.

1. Color: clear aluminum finish.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

2.4 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
2. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply [decals] at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

SECTION 10801 - TOILET AND BATH ACCESSORIES

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. Toilet and bath accessories.
2. Underlavatory guards.

B. Related Sections include the following:

1. Division 8 Section "Mirrored Glass" for frameless mirrors.
2. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule located in the drawings.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:

1. Toilet and Bath Accessories:

a. A & J Washroom Accessories, Inc.
b. American Specialties, Inc.

c. Bobrick Washroom Equipment, Inc.
d. Bradley Corporation.
e. General Accessory Manufacturing Co. (GAMCO).
f. McKinney/Parker Washroom Accessories Corp.

2. Underlavatory Guards:

a. Brocar Products, Inc.
b. Truebro, Inc.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule located in the drawings.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

C. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

F. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

G. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET ACCESSORY SCHEDULE

A. Provide toilet accessories per Toilet Accessory Legend found in drawings when manufacturer and/or catalogue number are not included provide product from same manufacturer and finish as other accessories specified.

END OF SECTION 10801

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SECTION 15010
BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 SUMMARY:

A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 15. It expands and supplements the requirements specified in sections of Division 1.

1.03 ACCESSIBILITY:

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

B. Allow time for inspections. The owner, architect, engineer or their designated representative will inspect all or any part of this system as they deem necessary, hereafter referred to as the **INSPECTING AUTHORITY**. It is the contractor's responsibility to schedule inspections of all work that is to be covered or concealed as part of this project, prior to the work being concealed. In the event of a discrepancy, notice shall be given by the **INSPECTING AUTHORITY**. Notice shall be verbal followed by a written notice, or by a written notice, whichever is deemed necessary, by the **INSPECTING AUTHORITY**. All additional work on the area in question shall cease until the discrepancy is resolved. The resolution of the discrepancy will be made by **OWNER, ARCHITECT AND ENGINEER JOINTLY,** and the final decision will be administered by the Architect. No extension of time or additional cost will be allowed for re-work done as a result of noncompliance or work after the notice of discrepancy has been given, as described above.

C. Record of inspections: The contractor shall maintain a record of inspections in conjunction with the as-built drawings. The inspection record shall indicate the location of all inspections, the name of the person doing the inspections, the results of the inspections, follow-up on discrepancies found, if any, and a final signature showing all items, with respect to that location, are complete. No portion will be covered, concealed, or incorporated into other components without the benefit of an inspection by the

INSPECTING AUTHORITY, and a record of that inspection being made, and maintained. The burden of proof, in the form of an inspection record, shall be the responsibility of the contractor. All work covered, concealed, or incorporated into other components and/or otherwise installed without the benefit of inspection, by the **INSPECTING AUTHORITY**, and the existence of an inspection record, shall be laid bare, uncovered, exposed, or otherwise made fully accessible to the **INSPECTING AUTHORITY**. Demolition, dismantling, or other activities require to accomplish this accessibility, and the subsequent re-assembly, or reconstruction, shall be done by the contractor, at no expense to the owner, and no additional time extensions of the contract completion date.

B. Equipment, and/or material installed, inspected, and otherwise considered complete at the time of inspection, and at a later date found not to be in accordance with the requirements of the contract, shall be removed, replaced, relocated, or otherwise made acceptable to the Architect, Engineer, and Owner. These shall include, but not limited to the following;
Equipment that is damaged, and/or becomes damaged, and/or contains concealed damage.
Equipment that becomes non-operational.
Equipment that leaks.
Equipment that becomes excessively noisy, and/or is found to have objectional noise vibration.
Equipment that is not properly matched or mated to system it is designed to enhance.
Equipment, attachments, or accessories that restrict accessibility or operation of other equipment, and/or components.
Equipment and/or components of the system that are considered to be adversely affected by additional construction after the installation and inspection.

1.04 MECHANICAL INSTALLATIONS:

A. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

B. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

C. When the removal of all or any part of a concrete masonry unit is necessary, it shall be

done by cutting or coring the masonry unit. Breaking the masonry unit is unacceptable. Broken or damaged masonry units or bricks shall be replaced by a worker skilled in the trade at no cost to the owner.

D. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

E. Where mounting heights are not detailed or dimensions noted, install mechanical services and overhead equipment to provide the maximum headroom possible. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations. Provide adequate accessibility, and clearances for all components requiring service. Maintain clearances as prescribed for all electrical equipment. Provide adequate room to remove components that are integral to the equipment. Provide adequate working room at all access doors and removable panels (36" MINIMUM). Provide ladders, gangways, platforms, and/or other safe working surfaces as prescribed or as directed, by the **INSPECTING AUTHORITY**, in the event conditions are encountered that warrant their need. All equipment must be accessible, and maintainable to the satisfaction of the **INSPECTING AUTHORITY**, as previously described.

1.05 DRAWINGS AND SPECIFICATIONS:

A. Separate divisional drawings and specifications shall not relieve the Contractor from full responsibility to complete all work which may be indicated on any of the drawings or in any division of the specification.

B. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work.

C. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for a complete installation are excluded.

D. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

E. Examine the architectural, structural, electrical and mechanical drawings and

specifications prior to submitting bid. Architectural and structural drawings take precedence over mechanical drawings with reference to building construction, location of plumbing fixtures, and any other similar fixed items.

F. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences which occur between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

G. Install all ceiling mounted components in strict accordance with architectural reflected ceiling plan.

1.06 CUTTING AND PATCHING:

A. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Do not cut structural members without prior written approval of the structural Engineer or Architect.

B. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

C. Perform cutting, fitting, and patching of mechanical equipment and materials required to: uncover Work to provide for installation of ill-timed Work; remove and replace defective Work; remove samples of installed Work as specified for testing; upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

1.07 PRODUCT LISTING:

A. Prepare listing of major mechanical equipment and materials for the project. Submit this listing as a part of the submittal requirement specified.

1.08 RECORD DOCUMENTS:

A. Refer to the Division 1 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 1.

B. Provide and maintain at the site a set of construction prints which indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, coil removal area, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensions for

column lines; actual inverts and locations of underground piping; concealed equipment, dimensions to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

C. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

D. Identify condensing units, air handlers and exhaust fans directly on record drawings by noting the unit's manufacturer, model number, nominal capacity, serial number and voltage. Identify electric heaters with capacity and voltage.

E. A copy of the original plans in Auto Cadd shall be available to the contractor upon request.

F. At the completion of the project the contractor shall prepare record drawings of the project. Transcribe the information on the construction prints to; (1) set magnetic media prepared in Auto Cadd, (1) set reproducibles and (3) additional sets.

1.09 PRODUCTS:

A. When two or more items of same material or equipment are required (plumbing fixtures, pumps, valves, air conditioning units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.

1.10 NAMEPLATE DATA:

A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.11 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Equipment and materials stored on the job site shall be for the exclusive use of this job. Equipment and materials not approved, submitted or applicable to the plans, design, or specification shall not be delivered and/or stored at the job site. Equipment and materials found on the job site that are not approved, submitted or deemed applicable shall be removed within ten working days or the owner reserves the right to remove such items and dispose of them in a manner determined by the owner at the contractor's expense.

D. Equipment and materials delivered and/or stored on the job site shall be protected from damage. Special attention shall be given to the protection of exposed coils, piping, and other components that would normally be protected after installation. Rigid protective covers shall be provided for these exposed surfaces. Equipment or materials not specifically designed for outdoor use or storage shall be provided with adequate protective cover that is approved by the **INSPECTING AUTHORITY**.

E. Equipment or material that becomes damaged shall be removed from the job site. The determination of the extent of damage shall be made by the **INSPECTING AUTHORITY** and will be final. Repair and reuse of damaged equipment or materials shall not be acceptable at any time through acceptance of the job. Equipment and materials found on the job site that are damaged shall be removed within ten working days or the owner reserves the right to remove such items and dispose of them in a manner determined by the owner at the contractor's expense.

1.12 OPERATION AND MAINTENANCE DATA:

A. In addition to the information required by Division 1 for Maintenance Data, include the following information:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

5. Manufacturer's wiring schematics, as-built wiring schematics, point configuration, location of disconnect means, power source description and location, modifications made to equipment, and all other applicable electrical information.

1.13 WARRANTIES:

A. Refer to the Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Division 15, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

D. No item warranted and/or guaranteed by its manufacturer shall be installed, used, stored, or otherwise handled in such a manner as to violate the warranties/guarantees as described by the manufacturer. A copy of the manufacturer's certification of conformance and/or compliance shall be provided at the request of the Inspecting Authority. Equipment or material that was/is installed, used, stored, or otherwise handled, that violates the manufacturers warranties/guarantees shall be removed and replaced with equipment and/or materials in conformance and/or compliance with the plans and specifications as directed by the Architect/Engineer. The burden of proof of conformance and/or compliance shall be with the contractor and shall be to the satisfaction of the Architect/Engineer. Corrections required shall be at no cost to the Owner.

1.14 CLEANING:

A. Refer to the Division 1 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

B. Refer to Division 15 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

1.15 SUPERVISION:

A. The contractor and/or the job superintendent shall thoroughly understand the operational requirements of the completed system, and shall have the experience with, and shall have successfully completed a system of this type under his/her direct supervision. The contractor shall maintain a staff of qualified foreman/supervisors in each category of the system construction that have a thorough understanding of that portion of the system, and that have successfully supervised the construction of a system of this type. At all times the individual trade foreman/supervisors will be under the direct supervision of the contractor and/or the job superintendent as described above. Tradesmen and/or laborers shall, at all times, be under the direct supervision of trade foreman/supervisor. It shall be the responsibility of the contractor to make known to the **INSPECTING AUTHORITY** who these individuals are, and the area of their responsibility. Work will not be conducted nor will it continue without supervision as described above.

1.16 TEMPORARY AND TRIAL USAGE:

A. Temporary and trial usage of any mechanical devices or equipment or materials shall not be construed as evidence of the acceptance of the same.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 15010

SECTION 15015
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this Section.

1.02 SUMMARY:

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Procedural requirements governing the Contractor's selection of products and product options are included in other sections.

1.03 DEFINITIONS:

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.

2. Revisions to Contract Documents requested by the Owner or Architect.

3. Specified options of products and construction methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities. These will have prior approval of the owner/architect and engineer.

1.04 SUBMITTALS:

A. Substitution Request Submittal: Requests for substitution will be considered if received within sixty days after commencement of the Work. Requests received more than

sixty days after commencement of the Work may be considered or rejected at the discretion of the Architect/Engineer.

1. Submit three copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

   a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.

   b. Samples, where applicable or requested.

   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

   d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.

   e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

   f. Cost information, including a proposal of the net change, in the Contract sum.

   g. Assurance that the substitution is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

B. Action: Within one week of receipt of the request for substitution, the Architect/Engineer will request additional information or documentation necessary for evaluation of the request. Within two weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed

substitution. Acceptance will be in the form of a Change Order. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use one of the products specified as approved.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS:

A. Conditions: The Contractor's substitution request will be received and considered by the Architect/Engineer when one or more of the following conditions are satisfied, as determined by the Architect/Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements. The burden of proof in all instances is with the contractor and must be conclusive to the satisfaction of the architect/engineer.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

6. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution can provide the required warranty.

10. Where a proposed substitution involves more than one Sub Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

B. The Contractor's submittal and Architect/Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 15015

SECTION 15020
SHOP DRAWINGS AND SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS:

A. This Section specifies procedural requirements for non-administrative submittals including shop drawings product data, samples, and other miscellaneous submittals.

B. Shop drawings are technical drawings and data that have been specially prepared for this project. Information required on shop drawings includes dimensions, identification of specific products and materials which are included in the work, compliance with specified standard and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Indicate deviations from the contract documents on the shop drawings.

C. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project. General information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.

D. Samples are physical examples of work. Documentation required specifically for sample submittals includes a generic description of the sample, the sample source or the product name or manufacturer, compliance with governing regulations and recognized standards. In addition, indicate limitations in terms of availability, sizes, delivery time, and similar limiting characteristics.

E. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories.

F. Products, Equipment, and/or Materials delivered to the job site must in, all cases, be as submitted and approved. Refer to Section 15010, 1.11. The burden of proof is with the contractor, The final acceptance will be made by the Architect, Engineer, and the Owner.

1.03 SUBMITTAL PROCEDURES:

A. Submit all Division 15 Shop Drawings, product data samples, and related documents in one package. Submittal should be as complete as possible and include the following:

1. Enclose submittal in 3-ring or similar loose leaf booklet.
2. Include title page and table of contents.
3. Include list of subcontractors' qualifications and suppliers.
4. Provide tabs in front of major submittal sections relating back to table of contents.

B. No individual submittal sections will be considered and will be returned marked "No Action", with the following exceptions:

1. Items with long "Lead Time" may be submitted early if all such items are packaged together.

2. Sheet metal, piping and control drawings may be submitted after initial submittal due to preparation time required. In no case will the allotted time exceed the maximum of sixty days.

C. Prepare and transmit the submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Advise the Architect/Engineer if processing time is critical to the progress of the work.

1. Allow two weeks minimum for the Architect/Engineer's initial processing of each submittal. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.

2. Allow one week for processing each re-submittal.

3. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

4. In the event that shop drawings have to be reviewed three (3) or more times, the contractor shall be responsible for the additional cost of processing the documents, The third submittal (and all subsequent submittals) shall be submitted with a cashier's check payable to the engineer. The processing fee shall be determined by the Engineer based on the size and complexity if the project.

D. Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.

1. Project name.
2. Date.
3. Name and address of Architect/Engineer, Contractor, subcontractor and supplier.
4. Name of manufacturer.
5. Number and title of appropriate specification section.

6. Drawing number and detail references, as appropriate.
7. Similar definitive information as necessary.
8. Provide a space on the label for the Contractor's review and approval markings, and a space for the Architect/Engineer's "Action" marking.

E. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender marked "No Action".

1.04 SPECIFIC SUBMITTAL REQUIREMENTS:

A. Shop Drawings: Provide six prints plus two additional prints where they are required for maintenance manuals. Two prints will be retained; the remainder will be returned. One of the prints returned will be marked-up and maintained by the Contractor as a "Record Document". Provide coordination drawings where required for the integration of the work. Show sequencing and relationship of separate units of work which are located in areas with restricted space. Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block.

1. ALL DRAWINGS INCLUDING BUT NOT LIMITED TO, Duct Layout Shop Drawings, Fire Sprinkler Shop Drawings, Underground piping of all types and Plumbing layout drawings shall follow the Mechanical drawing they are applicable too. Any deviation from this mechanical plan and/or specification shall be prominently identified by the use of a cloud or contrasting colors and an explanation for the deviation stated, refer to Section 15101, 1.06, C & D.

1. Prepare and submit a set of shop/coordination drawings showing major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining insulation, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.

2. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work including (but not necessarily limited to) the air handling and condensing unit locations.

3. Work in pipe spaces, chases, trenches, and tunnels. Indicate finish grade, as shown on Civil drawings. Indicate fill depth to top of pipe;

B. Product Data: Submit six copies. Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the

possession of the installer. Do not permit the use of unmarked copies of product data in connection with the performance of the work.

C. Miscellaneous Submittals:

1. Inspection and Test Reports: Classify each inspection and test report as being either "shop drawings" or "product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.

2. Warranties: Refer to other sections for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements. In addition to copies desired for the Contractor's use, furnish two executed copies of such warranties, bonds or agreements. Provide two additional copies where required for maintenance manuals.

3. Standards: Where submittal of a copy of standards is indicated, and except where copies of standards are specified as an integral part of a "Product Data" submittal, submit a single copy of standards for the Architect/Engineer's use.

4. Closeout Submittals: Refer to other sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.

   a. Record Documents: Furnish set of original documents as maintained on the project site. Along with original marked-up record drawings, provide two copies of marked-up drawings which may be reduced to not less than half size.

   b. Operation and Maintenance Data: Include description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts. Also include manufacturer's printed operating procedures, maintenance procedures, and servicing instructions, lubrication charts and schedules.

   c. Materials and Tools: Refer to individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

1.05 ARCHITECT/ENGINEER'S ACTION:

A. Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect/Engineer will review each submittal, mark with appropriate "Action Taken", and where possible return within two weeks of receipt. The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked to indicate one of the following:

1. Final Unrestricted Release: Where the submittals are marked "No Exception Taken", the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.

2. Final-But-Restricted Release: When the submittals are marked "Exception Taken as Noted", the work covered by the submittal may proceed provided it complies with both the Architect's/Engineer's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.

3. Returned for Re-submittal: When the submittal is marked either "Revise and Resubmit" or "Not Accepted Resubmit", do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with this marking to be used at the project site, or elsewhere where work is in progress.

4. Other Action: Where the submittal is returned, marked with the Architect/Engineer's explanation, for special processing or other Contractor activity, or is primarily for information or record purposes, the submittal will be marked "For Information Only".

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 15020

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SECTION 15060
PIPES AND PIPE FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of pipes and pipe fittings required by this Section is indicated on drawings and/or specified in other Division 15 sections. Types of pipes and pipe fittings specified in this Section include the following:

1. Steel Pipes.
2. Copper Tube.
3. Grooved Piping Products.
4. Miscellaneous Piping Materials/Products.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

B. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work or certify welding of piping work using Standard Procedure Specifications By, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).

C. Acid Waste System: Polypropylene pipe valves and fitting shall be guaranteed against failure due to original defects in material and workmanship for a period of 25 years (min.) from the date of original installation.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.

B. Welding Certifications: Submit reports as required for piping work.

C. Brazing Certifications: Submit reports as required for piping work.

D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manuals.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required preventing pipe-end damage and eliminating dirt and moisture from inside of pipe and tube.

PART 2 - PRODUCTS

2.01 STEEL PIPES AND PIPE FITTINGS:

A. Black Steel Pipe: ASTM A 53, A 106 or A 120; except comply with ASTM A 53 OR A 106 where close coiling or bending is required. Piping shall be cleaned and have two coats of rustoleum; after installation, touch up as required at any location that has painting removed as a result of installation.

B. Galvanized Steel Pipe: ASTM A 53 or A 120; except comply with ASTM A 53 where close coiling or bending is required.

C. Seamless Steel Pipe: ASTM A 53, A 106, or A 120; except comply with ASTM A 53 or A 106 where close coiling or bending is required.

D. Galvanized Seamless Steel Pipe: ASTM A 53, or A 120; except comply with ASTM A 53 where close coiling or bending is required.

E. Electric-Resistance-Welded Steel Pipe: ASTM A 135.

F. Cast-Iron Flanged Fittings: ANSI B16.1, including bolting.

G. Cast-Iron Threaded fittings: ANSI B16.4.

H. Malleable-Iron Threaded Fittings: ANSI B16.3; plain or galvanized as indicated.

I. Malleable-Iron Threaded Unions: ANSI B16.39; plain or galvanized as indicated.

J. Threaded Pipe Plugs: ANSI B16.14.

K. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.

L. Forged-Steel Socket-Welding and Threaded Fittings: ANSI B.16.11, except MSS SP-79 for threaded reducer inserts; rated to match of connected pipe.

M. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.

N. Cast-Iron Threaded Drainage Fittings: ANSI B16.12.

O. Forged Branch-connection Fittings: Comply with installation requirements.

P. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/2" and do not thread nipples full length (no close-nipples).

2.02 COPPER TUBE AND FITTINGS:

A. Copper Tube: ASTM B 88; Type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.

B. DWV Copper Tube: ASTM B 306.

C. Cast-Copper Solder-Joint Fittings: ANSI B16.18.

D. Wrought-copper Solder-Joint Fittings: ANSI B16.22.

E. Cast-copper Solder-Joint Drainage Fittings: ANSI B16.23.

F. Wrought-Copper Solder-Joint Drainage Fittings: ANSI B16.29

G. Cast-Copper Flared Tube Fittings: ANSI B16.26

H. Bronze Pipe Flanges/Fittings: ANSI B16.24

I. Copper-Tube Unions: As recommended by manufacturer.

2.03 PLASTIC PIPES AND PIPE FITTINGS:

A. Polyvinyl chloride pipe (PVC): Rigid PVC pipe shall be Type 1, Grade 1 as identified in ASTM D-1784 and state the manufacturers name and trademark.

B. PVC solvents and cleaners: All solvents, primers and cleaners for use with PVC piping shall be manufactured by Oatie, Inc., 4700 West 160 St., Cleveland, Ohio 44135 or approved equal.

1. Solvent Cement - Oatie No. 31014
2. Primer - Oatie No. 30768
3. Cleaner - Oatie No. 30766

C. Standard Specification for Propylene Plastic Injection and Extrusion Materials: ASTM D 4101.

D. Standard Specification for Drain, Waste and Vent (DWV) Plastic Fittings: ASTM 3311.

E. Standard Specification for (PVC) Plastic Pipe Schedule 40-80-120: ASTM 1785.

F. Test Method for Short Time Hydraulic Failure Pressure of Plastic Pipe and Fittings: ASTM 2122 and ASTM D 2665.

G. Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings: ASTM 1290.

H. Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems: ASTM 1412.

2.04 GROOVED PIPING PRODUCTS:

A. Mechanical grooved pipe couplings and fittings may be used for piping systems having operating conditions not exceeding 230°F excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.

B. Coupling Housings: Malleable iron conforming to ASTM A 47 or ductile iron conforming to ASTM A 536. Housings shall be grooved mechanical type, which engage grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nut and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.

C. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D 2000.

1. Water Services: EDPM Grade E, with green color code identification.
2. Other Services: As recommended by manufacturer.

D. Bolts and Nuts: Heat-treated carbon steel, ASTM A 183, minimum tensile 110,000 psi. Provide tamper resistant nuts for exposed locations.

E. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.

F. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.

1. Malleable Iron: ASTM A 47.
2. Ductile Iron: ASTM A 536.
3. Fabricated Steel: ASTM A 53, Type F for 3/4" to 1"; Type E or S, Grade B for 2" to 20".
4. Steel: ASTM A 234.

G. Flanges: Conform to Class 125 cast iron and class 150 steel bolt hole alignment.

1. Malleable Iron: ASTM A 47.
2. Ductile Iron: ASTM A 536.

H. Grooves: Square cut for standard steel, roll grooved for lightweight steel.

I. Acceptable Manufacturers: ITT Grinnell Corp., Gruvlok, and Victaulic Co., of America.

2.05 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:

A. Welding Materials: Comply with Section II, Part C ASME Boiler and Pressure Vessel, and with Code for welding materials.

B. Soldering Materials: Tin-Antimony Solder ASTM B 32, Grade 95TA; or Silver-Lead Solder, ASTM B 32, Grade 96TS.

C. Brazing Materials: Comply with SFA-5.8 and with code for brazing filler metal materials.

D. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges; unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Comply with ANSI B31 Code for Pressure Piping.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space
or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building. Where possible, locate insulated piping for 1" clearance outside insulation. Run piping mains 6" or more from fire rated walls to facilitate inspection.

C. Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces. Do not run piping above electrical panels as specified by NEC.

3.02 PIPING SYSTEM JOINTS:

A. Thread pipe in accordance with ANSI B.21; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint. Do not thread thin wall pipe.

B. Solder copper tube and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. No runs or puddling of solder on pipe or fittings.

C. Weld pipe joints in accordance with recognized industry practice. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.

D. AT installer's option, install cast-copper-alloy fittings wherever branch pipe of size smaller than main pipe is indicated; or install wrought-copper fittings. Mechanically formed tee's are not acceptable (T-Drill).

E. At Installer's option, install forged branch-connection fittings wherever branch pipe of size smaller than main pipe is indicated; or install regular "T" fitting. Mechanically formed Tee's are not acceptable (T-Drill).

F. Lead Joint Installation: Tightly pack joint with joint packing material. Do not permit packing to enter bore of finished joint. Clean joint after packing. Fill remaining joint space with one pouring of lead to indicated minimum depth measured from face of bell. After lead has cooled, caulk joint tightly by use of hammer and caulking iron.

G. PVC Pipe Fittings: Cut pipe square using a miter box, mechanical cut off saw or plastic pipe cutting tool. Remove all burrs from end of pipe with plastic deburring tool. Clean pipe and fitting with a clean dry cloth. Check dry fit of pipe and fitting. With applicator, apply primer freely to fitting socket keeping the surface and applicator wet until the surface has been softened. Apply the primer to the end of the pipe equal to the depth of the fitting socket. Apply a full even layer of cement to pipe and fitting while the surfaces are still wet with primer. Do not let cement puddle or run down the inside of the pipe. Assemble parts quickly, 1/4 turn motion. Hold together for 15 to 30 seconds. After assembly, wipe excess cement from pipe and fitting.

3.03 CLEANING, FLUSHING, INSPECTING:

A. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings. Inspect each run of each system for completion of joints, supports and accessory items. Inspect pressure piping in accordance with procedures of ASME B31. Disinfect water mains and water service piping in accordance with AWWA C601. A protective coating shall be applied within 24 hours after installation to all unprotected piping surfaces. Surfaces rendered unprotected by installation methods, cutting, threading or handling shall have a protective coating applied.

3.04 PIPING TESTS:

A. Test pressure piping in accordance with ASME B31.

B. Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate section where test pressure exceeds valve

pressure rating. Test each piping system for two hours at 150% of operating pressure indicated, but not less than 25 psi test pressure. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

C. Repair piping systems sections by disassembly and re-installation, using new materials. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

D. Pipe for the purpose of conveying liquid will be tested only after all air has been removed, and the content of the piping is 100% liquid. Air shall be successfully removed by whatever means necessary prior to test pressures being applied. The successfully removal of the air shall be demonstrated to the **INSPECTING AUTHORITY** who shall witness all testing. A complete record shall be kept of all testing. Necessary safety precautions shall be observed at all times, and only qualified persons shall conduct piping test. The contractor shall be responsible for any damage resulting in the failure of piping during testing. Final acceptance of piping shall not occur prior to final acceptance of the project as previously described. The contractor shall be responsible for the protection and care of all piping through the construction period. Piping that becomes damaged or disturbed shall be repaired and retested prior to continued use.

E. Piping that fails testing shall be retested after repairs are complete. Piping tested in sections will require re-testing as a complete system. Piping systems shall be re-tested if leaking occurs after the initial testing is successfully completed.

F. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 15060

SECTION 15120
PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 SUMMARY:

A. This Section specifies piping materials and installation methods common to more than one section of Division 15 and includes joining materials, piping specialties, including drip pans, sleeves, and seals and basic piping installation instructions.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

1.04 SUBMITTALS:

A. Product Data: Submit product data on escutcheons, dielectric unions and fittings, mechanical sleeve seals, roof drains and strainers.

B. Quality Control Submittals: Submit welders' certificates.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Provide factory-applied plastic end-caps on each length of pipe and tube, except for concrete, corrugated metal, hub-and-spigot, clay pipe. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

PART 2 - PRODUCTS

2.01 JOINING MATERIALS:

A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code.

B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code.

C. Soldering Materials: Refer to individual piping system specifications for solder appropriate for each respective system.

D. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21).

2.02 PIPING SPECIALTIES:

A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings. Acceptable manufacturers include Chicago Specialty Manufacturing Co., Sanitary-Dash Manufacturing Company, and Grinnell Co.

B. Unions: Malleable-iron, Class 150 for low pressure service and Class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

C. Dielectric Waterway Fittings: Acceptable manufacturers include Epco Sales Inc., and Victaulic Company of America.

D. Dielectric Unions: Provide dielectric unions which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion. Acceptable manufacturers include Eclipse Inc., Perfection Corp., and Watts Regulator Company.

E. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge.

2. Steel Sleeves: Schedule 40 galvanized welded steel pipe, ASTM A53, Grade A.

F. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

1. Lead and Oakum: Caulked between sleeve and pipe.

2. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and

electrical insulation. Acceptable manufacturers include Thunder Line Corp.

G. Fire Barrier Penetration Seals:

1. Cracks, Voids, or Holes up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, noncorrosive to metal, compatible with synthetic cable jackets, and capable of expanding ten times when exposed to flame or heat, UL listed.

2. Openings 4" or Greater: Use sealing system capable of passing three-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250°F to 350°F UL listed.

3. Acceptable manufacturers include Electro Products Div./3M, and Nelson (Unit of General Signal).

H. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

I. PVC Piping Solvents and Cleaners:

1. All solvent, primers and cleaners for use with PVC piping shall be manufactured by Oatie, Inc., 4700 West 160 St., Cleveland, Ohio 44135 or approved equal.

2. Solvent cement - Oatie #31014

3. Primer - Oatie purple primer.

4. Cleaner - Oatie cleaner.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe. Remove scale, slag, dirt, and debris both inside and outside of piping and fittings before assembly.

3.02 INSTALLATIONS:

A. So far as practical, install piping as indicated. Install piping free of sags or bends, tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with one inch clearance outside the

insulation. Allow sufficient space above removable ceiling panels to allow for panel removal. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing valves.

B. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap. Hose bibbs will not be used. If low points are created and are not on plans or shop drawings, a drain shall be installed and noted on as-built drawings.

C. Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6" shall be steel; pipe sleeves 6" and larger shall be sheet metal.

D. Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained.

E. Fire Barrier Penetration Seals: Provide seals for any opening through fire rated walls, floors, or ceilings used as a passage for mechanical components such as piping or ductwork. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

F. Escutcheons shall be used where piping enters or exits finished walls, cabinets and in the interior of cabinets, and elsewhere as noted in the specs and drawings.

G. Install manual air vents at all high points of the piping systems and as indicated on the drawings.

3.03 FITTINGS AND SPECIALTIES:

A. Remake leaking joints using new materials.

B. Install unions adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

C. Install flanges in piping 2-1/2" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.

D. Install dielectric unions to connect piping materials of dissimilar metals in all piping systems.

E. Pipe Sleeves: Install steel-pipe sleeves except as otherwise indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so

that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

F. Drip Pans: Locate drip pans under piping passing over or within three feet horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

3.04 JOINTS:

A. Steel Pipe Joints:

1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter.

2. Pipe Larger Than 2":

a. Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31. The use of backing rings is acceptable.

b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.

c. Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.1.0 Code for Pressure Piping.

B. Nonferrous Pipe Joints:

1. Brazed And Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.1.0 - Standard Code for Pressure Piping, Power Piping and ANSI B9.1 - Standard Safety Code for Mechanical Refrigeration. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.

2. Mechanical Joints: Flared compression fittings may be used for refrigerant lines

3/4" and smaller.

3. Provide solvent welded joints for all PVC connections.

3.05 TESTING:

A. See individual specification sections in which piping specialties are installed for testing procedures for piping systems.

END OF SECTION 15120

SECTION 15140
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of supports and anchors required by this Section is indicated on drawings and/or specified in other Division 15 sections. Types of supports and anchors specified in this Section include the following:

1. Horizontal-Piping Hangers and Supports.
2. Vertical-Piping Clamps.
3. Hanger-Rod Attachments.
4. Building Attachments.
5. Saddles and Shields.
6. Miscellaneous Materials.
7. Equipment Supports.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

B. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.

C. UL and FM Compliance: Provide products which are UL-listed and FM approved for sprinkler piping systems.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers offering hangers and supports which may be incorporated in work include B-Line Systems Inc., Carpenter and Patterson, Inc., Corner & Lada Co., Inc., Elcen Metal Products Co., Fee & Mason Mfg., Co. (Div. Figgie International), ITT Grinnell Corp., and Pipe

Shields, Inc.

2.02 HANGERS, ATTACHMENTS AND SUPPORTS:

A. Provide factory fabricated anchors, hangers, attachments, and supports complying with MSS SP-58, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers, attachments, and supports for copper-piping systems.

B. Horizontal-Piping Hangers and Supports:

1. Adjustable Steel Clevis Hangers: MSS Type 1 (Grinnell Fig. 260).
2. Steel Pipe Clamps: MSS Type 4 (Grinnell Fig. 212).
3. Adjustable Swivel Pipe Rings: MSS Type 6 (Grinnell Fig. 104).
4. Split Pipe Rings: MSS Type 11 (Grinnell Fig. 108).
5. U-Bolts: MSS Type 24 (Grinnell Fig. 137).
6. Strap: MSS Type 26 (Grinnell Fig. 262).
7. Adjustable Pipe Saddle Supports: MSS Type 38 (Grinnell Fig. 264), including steel pipe base support and cast-iron floor flange.
8. Single Pipe Rolls: MSS Type 41 (Grinnell Fig. 177).
9. Adjustable Roller Hangers: MSS Type 43 (Grinnell Fig. 177).
10. Adjustable Copper Tubing Hangers - Plastic Coated: MSS Type 9 (Grinnell Fig. CT-99C)
11. Galvanized Hanger Rods: (Grinnell Fig. 146)

C. Vertical - Piping Clamps: Two-Bolt Riser Clamps: MSS Type 8 (Grinnell Fig. 261).

D. Hanger - Rod Attachments: Steel Turnbuckles: MSS Type 13 (Grinnell Fig. 230).

E. Building Attachments:

1. Concrete Inserts: MSS Type 18 (Grinnell Fig. 285).
2. Top Beam C-Clamps: MSS Type 19 (Grinnell Fig. 94).
3. Side Beam or Channel Clamps: MSS Type 20 (Grinnell Fig. 225).
4. Center Beam Clamps: MSS Type 21 (Grinnell Fig. 134).
5. C-Clamps: MSS Type 23 (Grinnell Fig. 86).
6. Steel Brackets:
   a. Light Duty: MSS Type 31 (Grinnell Fig. 194).
   b. Medium Duty: MSS Type 32 (Grinnell Fig. 195).
   c. Heavy Duty: MSS Type 33 (Grinnell Fig. 199).
7. Horizontal Travelers: MSS Type 58 (Grinnell Fig. 170).

2.03 SADDLES AND SHIELDS:

A. Provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

B. Protection Shields: MSS Type 40 (Grinnell Fig. 167); of length recommended by manufacturer (minimum 12").

C. Protection Saddles: MSS Type 39 (Grinnell Fig. 160/165); saddles are 12" long with side edges turned up.

2.04 MISCELLANEOUS MATERIALS:

A. Metal Framing: Provide products complying with NEMA STD ML 1.

B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.

C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards. Each pipe to be supported by the trapeze will be provided with a saddle support, roller and/or clamps as is required by the location. Pipes will not be supported by a flat or square surface. Each pipe support, roller and/or clamp shall be contoured to the exact fit to mate the piping insulation and the required saddle and shields. The trapeze shall be of rigid design with pipe movement allowances made with rollers. The design shall incorporate bracing.

E. Equipment Supports: Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed Correct inadequacies including proper placement of

inserts, anchors and other building structural attachments. Installation of hangers, supports, anchors and associated work must be coordinated with all work by other disciplines to avoid conflicts.

3.02 INSTALLATION OF HANGERS, ATTACHMENTS AND SUPPORTS:

A. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers. Install supports with maximum spacings complying with MSS SP-69. Do not use wire or perforated metal to support piping, and do not support piping from other piping. Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

B. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment, and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units. Support all vertical or horizontal runs 6'-0" or over in length.

C. Insulated Piping:

1. Clamps: Attach clamps, including spacers, to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold water piping, install coated protective shields.

D. Install building attachments within concrete or on structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional supports at concentrated loads and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

E. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with suggested hanger spacing and rod sizes for straight horizontal runs according to MSS SP-69 as tabulated below:

Pipe Size (Inches)	Hanger Spacing (Feet)			Rod Size (Inches)
	Std. Wt. Steel Pipe		Copper Tube	
	Water	Steam	Water	

1/2	7	8	5	1/4
3/4	7	9	5	1/4
1	7	9	6	1/4
1-1/2	9	12	8	3/8
2	10	13	8	3/8
2-1/2	11	14	9	3/8
3	12	15	10	3/8
4	14	17	12	1/2

F. Support both legs of all elbows within one foot of the elbow.

G. Provide additional hangers at pipe fittings as required to eliminate sags.

3.03 ADJUSTING AND CLEANING:

A. Adjust hangers so as to distribute loads equally on attachments.

B. Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Clean all factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint. All hanger assemblies shall be clean and free of any rust. At the discretion of the engineer, surfaces incurring excessive damage/rust shall be replaced at no additional cost to the owner.

END OF SECTION 15140

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SECTION 15250
MECHANICAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of mechanical insulation required by this Section is indicated on drawings and schedules, and by requirements of this Section. Types of mechanical insulation specified in this Section include the following:

1. Insulation of piping, tanks, fittings and other surfaces.

2. Insulation of ductwork, air devices and all equipment pertaining to the air distribution system.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

B. Installer's Qualifications: Firm with at least five years successful installation experience on projects with mechanical insulations similar to that required for this project.

C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of twenty-five or less, and smoke-developed index of fifty or less, in accordance with NFPA 90A.

D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction."

E. Insulation Materials - Insulation materials must be manufacturered at facilities certified and registered with an approved registered to conform to ISO 9000 quality standard.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 - PRODUCTS

1.05 DELIVERY AND STORAGE OF MATERIALS:

A. Deliver all materials to the job site and protect the insulation against dirt, water, chemicals, and mechanical damage before, during, and after installation. Do not install damaged or wet insulation and remove it from the job site.

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers offering products which may be incorporated in the work include Armstrong World Industries, Inc., CertainTeed Corp., Knauf Fiber Glass GmbH., Johns-Manville Products Corp., Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp., and Rubatex Corp.

2.02 PIPING INSULATION MATERIALS:

A. Flexible unicellular piping insulation (Armaflex): Preformed split sectional closed-cell pipe insulation. Suitable for operating temperatures of -40°F to +220°F. Thermal conductivity "K" factor of 0.27. Insulation to have a flame spread/smoke developed rating of 25/50 or less. Cover all exterior insulation with aluminum jacket or UV protective paint.

B. Jackets:

1. Type A: Smooth or embossed aluminum jacket, 0.016" minimum thickness secured with one-half inch aluminum bands, for all exterior installations.

2. Type B: Pre-sized reinforced glass cloth, smoothly adhered to insulation or cement surface with lagging adhesive; lap joints a minimum of three inches and adhere with lagging adhesive.

3. Type C: PVC Plastic; similar to Zeston 2000. One piece molded type fitting covers and Jekting, gloss white.

D. Fittings: Provide fitting coverings of a similar material and thickness as adjacent pipe coverings. Cover all elbows, tees, valves, flanges and other fittings of piping system.

E. Accessories: All staples, bands, wires, adhesives, cements, sealers and protective finishes to be as recommended by insulation manufacturers.

PART 3 – EXECUTION

3.01 INSPECTION:

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSULATION INSTALLATION, GENERAL:

A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.

B. Install insulation materials with smooth and even surfaces. Do not use cut pieces or scraps abutting each other.

C. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered. Maintain integrity of vapor-barrier, and protect to prevent puncture or other damage. All surfaces requiring primer will be primed, inspected and approved, prior to the installation of insulating materials.

D. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

E. Protect outdoor insulation from weather or ultraviolet deterioration by installing outdoor protective finish or jacketing.

F. Should condensation occur after the installation of insulating material or in the event the insulation becomes wet, the insulation will be removed and replaced, at no cost to the owner and no time extension to the completion date.

G. The contractor shall be responsible to coordinate the installation of all insulation materials, and the protection after installation of all finished surfaces through the completion, and the acceptance of the project, as previously described.

3.03 HVAC PIPING SYSTEM INSULATION:

A. Omit insulation on cold piping within unit cabinets provided piping is located over drain pan; and on unions.

B. Insulate condensate drain piping inside and outside of the building with flexible unicellular insulation 1/2" thick for all pipe sizes.

C. Insulate refrigerant suction lines between evaporators and compressors, and refrigerant hot gas piping with flexible unicellular insulation, 3/4" thick for pipe sizes up to 2"; 1" thick for pipe sizes 2 1/2" and larger.

D. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units except where specific form or type is indicated.

E. Butt pipe insulation against pipe insulation inserts. For cold piping apply a wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.05 REPAIR, REPLACEMENT AND PROTECTION:

A. Repair or replace damaged sections of existing mechanical insulation, including units with vapor barrier damage and moisture saturated units damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

B. Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 15250

SECTION 15782 - ROOFTOP HEATING AND COOLING UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 SUMMARY:

A. This Section includes package rooftop heating and cooling units. Refer to Division 16 section for electrical connections for equipment.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.

B. Shop Drawings: Submit shop drawings detailing the mounting, securing, and flashing of the roof curb to the roof structure. Indicate coordinating requirements with roof membrane system.

C. Wiring Diagrams: Submit manufacturer's wiring diagrams that detail power, signal, and control wiring. Clearly differentiate factory-installed and field-installed wiring.

D. Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including "trouble-shooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in maintenance manual.

1.04 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of rooftop heating and cooling units, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five years.

B. Gas-fired furnace section construction shall be in accordance with AGA safety standards. Furnace section shall bear the AGA label.

C. Testing and rating of rooftop units of 135,000 Btuh capacity or over shall be in accordance with ARI 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".

D. Testing and rating of rooftop units under 135,000 Btuh capacity shall be in accordance with ARI 210 "Standard for Unitary Air-Conditioning Equipment", and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 "Standard for Sound Rating of Outdoor Unitary Equipment". Units shall bear Certified Rating Seal.

E. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".

F. Energy Efficiency Ratio (EER) of rooftop units shall be equal to or greater than prescribed by ASHRAE 90A "Energy Conservation in New Building Design".

G. Rooftop units shall be listed by UL and have UL label as a unit, and shall be designed, manufactured, and tested in accordance with UL requirements.

H. Comply with the latest approved edition of the Florida Energy Code for Building Construction.

1.05 SCHEDULING AND SEQUENCING:

A. Coordinate installation of roof mounting curb with roof structure.

B. Coordinate roof opening locations for mechanical and electrical connections.

1.06 SPECIAL WARRANTY:

A. Warranty on Compressor and Heat Exchanger: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation. Warranty period shall extend five years from date of substantial completion.

PART 2 - PRODUCTS

2.01 ROOFTOP UNITS, GENERAL:

A. Acceptable manufacturers include BDP Co. (Division of Carrier Corp.), Carrier Air Conditioning (Division of Carrier Corp.), Climate Control Div. (Unit of Snyder General Corp.), Governair Corp., Lennox Industries, Inc., McQuay Air Conditioning Group (McQuay Inc.), Trane (The) Co. (Division of American Standard Inc.)

B. Casing: Manufacturer's standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, knockouts for electrical and piping connections and an exterior condensate drain connection and lifting lugs. Provide 1/2" thick thermal insulation for casings of units having less than 20 tons capacity, and 1" thick thermal insulation for units 20 tons and larger.

C. Roof Curbs: Manufacturer's standard construction, insulated and having corrosive protective coating, complete with factory installed wood nailer and drain nipple. Construction shall be in accordance with NRCA Standards.

D. Evaporator Fans: Forward-curved, centrifugal, belt-driven fans with adjustable sheaves or direct-driven fans; and permanently lubricated motor bearings. Units having less than 20 tons capacity may utilize direct driven fans.

E. Condenser Fans: Propeller-type, direct-driven fans with permanently lubricated bearings.

F. Coils:

1. General: Aluminum plate fin and seamless copper tube type. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit through the roof or through the piping enclosure. Coil section shall be completely insulated.

2. Steam Heating Coils: Non-freeze steam coils, pitched in unit casing for proper drainage. Coils shall be double tube type having accurately sized steam distributor tubes and evenly spaced orifices. Orifices shall discharge steam in the direction of condensate flow to ensure even distribution of steam over full length of each tube. Coils shall be proof (150 psig) and leak (100 psig) tested with air pressure under water.

3. Water Heating Coils: Pitched in the unit casing for proper drainage. Coils shall have metering orifices and a supply header to ensure distribution of hot water to each tube. Coils shall have continuous tube type, and proof (300 psig) and leak (200 psig) tested with air pressure under water.

4. Refrigerant Cooling Coils: Have an equalizing type vertical distributor to ensure each coil circuit receives the same amount of refrigerant. Coils shall be proof (450 psig) and leak (300 psig) tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of nitrogen.

H. Compressors: Serviceable, semi-hermetic, or fully hermetic compressors, complete with integral vibration isolators and crankcase heaters which de-energize during compressor operation.

I. Safety Controls: Manual reset type for low pressure cutout, high pressure cutout, anti short cycle timer, and compressor motor overload protection.

J. Motors: Provide high efficiency motors for those one horsepower and above.

K. Economizer Control: Return and outside air dampers, outside air filter, fully modulating electric control system with enthalpy control, and adjustable mixed-air thermostat. System shall have 100 percent outside air capability. Provide automatic changeover through adjustable enthalpy control device.

L. Variable Air Volume Control: Discharge air step controller, and electric control system with enthalpy control.

M. Electric Heat Sections: Electric heat coils, of manufacturer's standard construction, factory-wired for single point wiring connection, complete with over-current and over-heat protection devices.

N. Accessories: Units shall include the following accessories as indicated or scheduled:

1. Low Ambient Control: Head pressure control, designed to operate at temperatures down to 0°F.

2. Thermostat: Assembly shall provide for staged heating and cooling with manual or automatic changeover on standard subbase.

2.02 ROOFTOP UNITS, 20 TONS AND LARGER:

A. Compressors: Include Cylinder unloaders for capacity control, with minimum steps as scheduled; Hot-gas bypass valve and piping on one compressor for variable air volume systems; thermal expansion valves, filter dryers, sight glasses, compressor service valves, liquid line service valves; minimum of two refrigerant circuits for units having two or more compressors; and fan-cycling control for low ambient control to 0.

B. Safety Controls: Include adjustable low-ambient lockout, and oil pressure switch.

C. Heat Exchangers: Flame roll-out switch.

D. Filters section: 2" thick fiberglass throwaway filters in filter rack, with maximum face velocity of 300 fpm.

E. Electrical: Units shall have 115 VAC convenience outlet, separately fused, for unit service. Unit power connection shall be either through unit cabinet or within roof curb perimeter.

F. Temperature control: Factory-installed, demand-oriented solid-state control system with minimum of two cooling steps and two heating steps. Controls shall include solid-state thermostats with deadband, and sub-base with system and fan switches. Other control features include discharge temperature reset capability with space temperature override; seven-day programmable time clock, with power failure carry-over, for remote mounting; and warm-up cycle.

G. Accessories: Units shall include the following accessories as indicated or scheduled:

1. Remote Control Panel: Furnish panel for remote mounting containing control of heating, cooling, evaporator fan, and outdoor air damper; and indicator lights for up to six unit functions.

2. Anti-short-cycling control to automatically prevent compressor restart for 5-minutes after shutdown.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine areas and conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION:

A. Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Support: Install and secure roof curb to roof structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.

C. Electrical Connections: Refer to Division 16 for final connections to equipment and installation of loose shipped electrical components.

3.03 DEMONSTRATION AND SPARE PARTS:

A. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

B. Provide services of manufacturer's service representative to instruct Owner's personnel in operation and maintenance of rooftop units. Training shall include start-up and shut-down, servicing and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance. Review operating and maintenance data contained in the Operating and Maintenance Manuals specified in Division One.

C. Extra Materials: Furnish to Owner, with receipt, the following spare parts for each rooftop heating and cooling unit consisting of one set of matched fan belts for each belt-driven fan, and one set of filters for each unit.

END OF SECTION 15782

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SECTION 15990
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. Related Sections:

1. Other Division 15 sections specify balancing devices and their installation, and materials and installations of mechanical systems.

2. Individual Division 15 System Sections specify leak testing requirements and procedures.

1.02 SUMMARY:

A. This Section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results. This section has been included for the contractors information and the requirements of the contractor for the proper interface with the owners Tab Agency (Agency).

C. Test, adjust, and balance the following mechanical systems:

1. Supply air systems.

D. Test systems for proper sound and vibration levels.

E. Test requirements and procedures for Duct Leakage Test.

F. This Section does not include:

1. Testing boilers and pressure vessels for compliance with safety codes;

2. Specifications for materials for patching mechanical systems;

3. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

4. Requirements and procedures for piping leakage tests.

1.03 DEFINITIONS:

A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:

1. The balance of air distribution;
2. Adjustment of total system to provide design quantities;
3. Electrical measurement;
4. Verification of performance of all equipment and automatic controls;
5. Sound and vibration measurement.

B. Test: To determine quantitative performance of equipment.

C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

F. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

H. Main: Duct or pipe containing the system's major or entire air flow.

I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.

J. Branch main: Duct or pipe serving two or more terminals.

K. Branch: Duct or pipe serving a single terminal.

1.04 SUBMITTALS:

A. Engineer and Technicians Data:

1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures and the technicians proposed to perform the procedures meet the qualifications specified below.

B. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

1. Pre-Construction Plan Check: Agency shall review the Plans and/or visit the site prior to the start of construction of the project (new or existing systems). Notify the installing contractor and Architect/Engineer in writing of any modifications or changes to the system(s), and how they should be made to allow the most effective total system balance.

C. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC are proposed.

D. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.

E. Draft Reports: Within one week of completion of testing, adjusting, and balancing procedures, submit draft report directly to the Engineer on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit two (2) complete sets of draft reports. Only 1 complete set of draft reports will be returned.

1. Immediately notify the Architect/Engineer in writing of any system(s) that do not provide the design quantities as scheduled and specified.

2. Coordinate with installing contractor, those items or systems that require corrective action to meet design performance, in a timely manner. Retest after corrections have been accomplished.

F. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit four (4) complete sets of final reports.

G. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted,

and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:

1. General Information and Summary.
2. Air Systems.
3. Temperature Control Systems.
4. Special Systems.
5. Sound and Vibration Systems.

H. Report Contents: Provide the following minimum information, forms and data:

1. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration. Provide the Associated Air Balance Council National Project Certification Performance Guaranty.

2. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

I. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.05 QUALITY ASSURANCE:

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

2. The independent testing, adjusting, and balancing agency shall be certified by The Associated Air Balance Council (AABC) in those testing and balancing

disciplines required for this project, and having at least one certified Test and Balance Engineer.

B. Codes and Standards:

1. AABC: "National Standards for Total System Balance"

2. ASHRAE: "ASHRAE Handbook,"Systems Volume, Chapter 57, Testing, Adjusting, and Balancing.

C. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting and balancing.

D. Compliance with the latest approved edition of the "Florida Energy Code for Building Construction."

1.06 PROJECT CONDITIONS:

A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.07 SEQUENCING AND SCHEDULING:

A. Test, adjust and balance the air systems before refrigerant systems.

B. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

A. Before operating the system, perform these steps:

1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.

3. Compare design to installed equipment and field installations.

4. Walk the system from the central equipment to terminal units to determine variations of installation from design.

5. Check filters for cleanliness.

6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.

7. Prepare report test sheets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check.

8. Determine best locations in main and branch ductwork for most accurate duct traverses.

9. Place outlet dampers in the full open position.

10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

11. Lubricate all motors and bearings.

12. Check fan belt tension.

13. Check fan rotation.

3.02 PRELIMINARY PROCEDURES FOR HYDRONIC SYSTEM BALANCING:

A. Before operating the system perform these steps:

1. Lubricate all motors and bearings.

3.03 MEASUREMENTS:

A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. Apply instrument as recommended by the manufacturer.

E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

G. Take all reading with the eye at the level of the indicated value to prevent parallax.

H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.

I. Take measurements in the system where best suited to the task.

3.04 PERFORMING TESTING, ADJUSTING, AND BALANCING:

A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

C. Patch insulation, ductwork, and housings, using materials identical to those removed.

D. Seal ducts and piping, and test holes with approved plugs.

E. Seal insulation to re-establish integrity of the vapor barrier.

F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials. Record digital set points where applicable.

G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.05 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR:

A. The mechanical contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.

B. Air Distribution Systems:

1. Verify installation for conformity to design.

5. Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.

6. Lubricating all motors and bearings.

7. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.

8. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost to the Owner.

9. Install clean filters.

3.07 TESTING FOR SOUND AND VIBRATION:

A. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.08 RECORD AND REPORT DATA:

A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

C. Return one time to the project to retest and adjust reported deficient systems or components. If systems are not completed when notified by the contractor, the cost of the return trip will be charged to the contractor by the owner and the owner will pay the agency.

END OF SECTION 15990

SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

PART I - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 CODES:

A. The work shall be in conformance with the following:

1.	NFPA 70	2008	NATIONAL ELECTRICAL CODE
2.	NFPA 72	2002	NATIONAL FIRE ALARM CODE
3.	NFPA 90A	2002	STANDARD FOR AIR CONDITIONING AND VENTALATION
4.	NFPA101	2006	LIFE SAFETY CODE
5.	FBC	2007	FLORIDA BUILDING CODE WITH 2009 AMENDMENTS

B. The installation shall also comply with all applicable rules and regulations of local and state laws and ordinances. Include in the work, without extra cost any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations. Inform the architect of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.03 CONSTRUCTION DRAWINGS:

A. The electrical plans shall serve as working drawings. They indicate general layout of complete electrical system, arrangement of feeders, circuits, outlets, switches, controls, panelboards, service equipment, fixtures, and other work.

B. Field verify scale dimension on plans since locations, distances and elevations will be governed by actual field conditions.

C. Review architectural, structural, plumbing, heating, ventilation and fire protection plans and coordinate electrical work with conditions indicated therein.

D. Where discrepancies occur in plans and specifications, promptly report them to architect/engineer for resolution.

E. Include items not specifically mentioned in specifications or noted, but which are obviously necessary to meet requirements of applicable codes and to make a complete working installation.

1.04 ROUGH-IN:

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 15 for rough-in requirements.

1.05 ELECTRICAL INSTALLATIONS:

A. Existing services shall not be interrupted without prior consent of the owner's authorized representative and may be interrupted only at and for the specific time designated by the owner's authorized representative.

B. Make a thorough examination of the site and the contract documents. No claim for extra compensation will be recognized if difficulties are encountered which an examination of site conditions and contract documents prior to executing contract would have revealed.

C. Coordinate electrical equipment and materials installation with other building components.

D. Verify all dimensions by field measurements.

E. Arrange for chases, slots, and openings in other building components to allow for electrical installations.

F. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

G. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.

H. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

I. Coordinate the installation of electrical materials and equipment above ceilings with suspension system, mechanical equipment and systems, and structural components.

J. Temporary electrical service and construction lighting shall be provided under this section. Provide for all electrical service for construction period, making all connections and removal of same at job conclusion. Furnish and install temporary lighting for construction period. At job completion, all temporary lamps shall be removed and replaced with new lamps.

1.06 CUTTING AND PATCHING:

A. Refer to the Division 1 Section: CUTTING AND PATCHING for general requirements for cutting and patching.

B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

C. Arrange for repairs required to restore other work, because of damage caused as a result of electrical installations.

D. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

E. Perform cutting, fitting, and patching of electrical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work;

2. Remove and replace defective Work;

3. Remove and replace Work not conforming to requirements of the Contract Documents;

4. Remove samples of installed Work as specified for testing;

5. Install equipment and materials in existing structures;

6. Upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

F. Cut, remove and legally dispose of selected electrical equipment, components, and materials as indicated, including, but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.

G. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

H. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

I. Locate, identify, and protect electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

1.07 ELECTRICAL SUBMITTALS:

A. Refer to the Conditions of the Contract (General and Supplemental General Conditions) and Division 1 Section: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal definitions, requirements, and procedures.

B. Submittal of shop drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.

1.08 PRODUCT OPTIONS AND SUBSTITUTIONS:

A. Refer to the Instructions to Bidders and the Division 1 Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.09 PRODUCT LISTING:

A. Prepare listing of major electrical equipment and materials for the project.

B. Submit this listing as a part of the submittal requirement specified in the Division 1 Section: PRODUCTS AND SUBSTITUTION.

C. When two or more items of the same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.

D. Provide products which are compatible with systems and other connected items.

E. No substitution will be considered unless written request has been submitted to the Architect at least ten (10) days prior to the date for receipt of bids.

F. If the Architect approves any proposed substitutions, such approval will be set forth in an addendum.

1.10 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.11 RECORD DOCUMENTS:

A. Refer to the Division 1 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 1.

B. Mark drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned for column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; change orders; concealed control system devices.

C. Mark Specifications to indicate approved substitutions; change orders; actual equipment and materials used.

1.12 WARRANTIES:

A. Refer to the Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Compile and assemble the warranties specified in Division 16, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.13 CLEANING:

A. Refer to the Division 1 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

B. Clean all light fixtures, lamps and lenses prior to final acceptance. Replace all inoperative lamps.

END OF SECTION 16010

SECTION 16110
RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to electrical raceways specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of raceway work is indicated by drawings and schedules.

B. Types of raceways specified in this section include the following:

1. Electrical metallic tubing (EMT).
2. Liquid-tight flexible metal conduit.
3. Rigid metal conduit.
4. Flexible metal conduit.
5. Wireways.
6. Nonmetallic Conduit.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience on projects with electrical raceway work similar to that required for this project.

C. Codes and Standards:

1. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL-listed and labeled.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING:

A. General: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated.

B. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.

C. Rigid Steel Conduit: Provide rigid steel, hot dipped galvanized, threaded type.

D. Flexible Metal Conduit: UL 1. Formed from continuous length of spirally wound, interlocked zinc-coated strip steel.

E. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC).

F. Rigid Metal Conduit Fittings: Cast malleable iron, galvanized or cadmium plated.

1. Use Type 1 fittings for rain-tight connections.
2. Use Type 2 fittings for concrete tight connections.

G. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.

1. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2. 45° or 90° Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

H. Liquid-Tight Flexible Metal Conduit Fittings: Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or noninsulated throat.

I. Electrical Metallic Tubing (EMT): UL 797.

J. EMT Fittings: Couplings and connectors for conduit shall be steel insulated throat steel set screw type. Die cast zinc fittings will not be allowed.

2.02 NONMETALLIC CONDUIT AND DUCTS:

A. General: Provide nonmetallic conduit, and fittings of types, sizes and weights for electrical service. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements which comply with provisions of NEC for raceways.

B. Electrical Plastic Conduit:

1. Heavy Wall Conduit: Schedule 40, 90°C, UL-rated, constructed of polyvinyl chloride. For direct burial, UL-listed and in conformity with NEC Article 352.

C. Conduit, and Tubing Accessories: Provide conduit, tubing and duct accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

2.03 WIREWAYS:

A. General: Provide electrical wireways of types, grades, sizes, and number of channels for each type of service as indicated. Provide complete assembly of raceway including, but not limited to, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other components and accessories as required for complete system.

B. Lay-in Wireways: Construct lay-in wireways with hinged covers, in accordance with UL 870 and with components UL-listed, including lengths, connectors, and fittings. Select units to allow fastening hinged cover closed without use of parts other than standard lengths, fittings and connectors. Construct units to be capable of sealing cover in closed position with sealing wire. Provide wireways with knockouts.

1. Connectors: Provide wireway connectors suitable for "lay-in" conductors, with connector covers permanently attached that removal is not necessary to utilize the lay-in feature.

2. Finish: Protect sheet metal parts with rust inhibiting coating and baked enamel finish. Plate finish hardware to prevent corrosion. Protect screws installed toward inside of wireway with spring nuts to prevent wire insulation damage.

C. Rain-tight Wireway: Construct rain-tight lay-in wireways with hinged covers, in accordance with UL 870 and with components UL listed, including lengths, connectors and fittings. Design units to allow fastening hinged cover closed without

use of parts other than standard lengths, fittings and connectors. Construct units to be capable of sealing cover in closed position with sealing wire. Provide wireway units with knockouts only in bottom of troughs.

D. Rain-tight Troughs: Construct in accordance with UL 870, with components UL-listed.

1. Construction: 16-gauge galvanized sheet metal parts for 4" x 4" to 6" x 6" sections, and 14-gauge parts for 8" x 8" and larger sections. Provide knockouts only in bottom of troughs, with suitable adapters to facilitate attaching to other NEMA 3R enclosures. Do not use gasketing that can rip or tear during installation, or would compromise rain-tight capability of the trough. Do not use cover screws that will protrude into the trough area and damage wire insulation.

2. Finish: Provide 14-gauge and 16-gauge galvanized sheet metal parts with corrosion-resistant phosphate primer and baked enamel finish. Plate hardware to prevent corrosion.

PART 3 - EXECUTION

3.01 OBSERVATION:

A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF RACEWAYS:

A. General: Raceways run below grade, under floors on grade, or in concrete shall be rigid steel conduit or heavy PVC heavy wall type (schedule 40) conduit provided rigid steel conduit is used on elbows and risers to boxes, cabinet, etc.. All other raceways may be thin wall conduit. Conduit run above accessible ceilings shall be supported from the structure and shall not be supported from or attached to ceiling suspension system. Double lock nuts shall be used on all rigid conduit terminations except threaded hubs. All conduit shall be made up tight and no running threads will be permitted. Use "Erickson" couplings where necessary. All metallic conduit runs below grade or under floors on grade shall be given a heavy coat of bitumastic paint.

B. Sizes of raceways shall be not less than NEC requirements and shall not in any case be less than indicated on the drawings. Larger size raceways and/or pull boxes shall be installed if there is excessive length of unbroken run or excessive number of

bends. Combining of circuits other than those indicated on the drawings will not be permitted.

C. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

1. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
2. Use roughing-in dimensions of electrically operated unit furnished by supplier. Set conduit and boxes for connection to units only after receiving review of dimensions and after checking location with other trades.

3. Provide nylon pull cord in empty conduits where indicated. Test all empty conduits with ball mandrel. Clear any conduit which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition.

4. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:

a. Exterior location.
b. Moist or humid atmosphere where condensate can be expected to accumulate.
c. Corrosive atmosphere.
d. Subjected to water spray or dripping oil, water or grease.

D. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

E. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

F. Fasten conduit terminations in sheet metal enclosures by two (2) locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.

G. Conduits are not to cross pipe shafts, or ventilating duct openings.

H. Keep conduits a minimum distance of six inches (6") from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

I. Support riser conduit at each floor level with clamp hangers.

J. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.

K. Complete installation of electrical raceways before starting installation of cables/wires within raceways.

L. Concealed Conduits:

1. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure water tightness.

2. For floors-on-grade, install conduits under concrete slabs.
3. Install underground conduits minimum of 24" below finished grade. **Caution must be exercised when trenching to avoid any existing buried utilities.**
4. Concealed conduits shall be installed parallel or at right angles to walls of building.

M. Conduits in Concrete Slabs:

1. Place conduits between bottom reinforcing steel and top reinforcing steel. Place conduits either parallel, or at 90 degrees, to main reinforcing steel.

2. Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond.

3. Conduits crossing in slab must be reviewed for proper cover by Engineer.

4. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness.

N. Install conduits as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.

O. Exposed Conduits:

1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.

2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.

3. Support exposed conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed 8'-0".

4. Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.

5. Above requirements for exposed conduits also apply to conduits installed in space above hung ceilings, and in crawl spaces.

P. Conduit Fittings:

1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

2. Install insulated type bushings for terminating conduits. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.

3. Bushing of standard or insulated type to have screw type grounding terminal.

4. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.

3.03 FIELD QUALITY CONTROL:

A. General: Mechanically assemble metal enclosures, and raceways for conductors to form continuous electrical conductor, and connect to electrical boxes, fittings and cabinets as to provide effective electrical continuity and rigid mechanical assembly.

B. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.

C. Install expansion fittings in all raceways wherever structural expansion joints are crossed.

D. Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted.

E. Properly support and anchor raceways for their entire length by structural materials. Raceways are not to span any space unsupported.

F. Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.

G. Raceway penetrations of fire rated walls and/or floors shall be sealed to maintain integrity of construction. All products, materials and methods of installation shall be UL approved and meet NFPA requirements.

H. Fire rating of construction assemblies are specified under architectural section of the contract documents.

I. Unless otherwise noted on drawings; notified by architect and/or authorities having jurisdiction; the following materials may be used.

1. Rock wool: Minimum four pound per cubic foot density; flame spread 15, smoke developed 0, fuel contribution 0 by ASTM 384; minimum melting point 2000°F.

2. Concrete and masonry are also approved firestop materials by NFPA 90A.

3. UL approved products such as Nelson Type CLK Silicon Sealant. Manufacturers recommendations shall be strictly followed.

J. Submit complete data on fire stopping materials and construction methods of review by architect before proceeding with work.

END OF SECTION 16110

SECTION 16120
WIRES AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to electrical raceways specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical wire and cable work is indicated by drawings and schedules.

B. Types of electrical wire, cable, and connectors specified in this Section include the following:

1. Copper conductors.
2. Fixture wires.
3. Split-bolt connectors.
4. Wirenut connectors.

C. Applications of electrical wire, cable, and connectors required for project are as follows:

1. Power distribution circuits.
2. Lighting circuits.
3. Appliance and equipment circuits.
4. Motor-branch circuits.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than five years.

B. Installer's Qualifications: Firm with at least three years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cables.

D. IEEE Compliance: Comply with applicable requirements of IEEE Stds. 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.

E. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8 and D-753. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F).

F. The following systems of color coding shall be strictly adhered to:

1. grounded leads, green;
2. 120/208 volt, ungrounded phase wires, black, red and blue, neutral-white
3. 277/480 volt, ungrounded phase wires, yellow, orange and brown.

G. The color code assigned to each phase wire shall be consistently followed throughout.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA specified type wire and cable reels.

B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.

C. Handle wire and cable carefully to avoid abrading, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

PART 2 - PRODUCTS

2.01 Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated.

A. Conductor #10 and smaller shall be dual type THHN/THWN 75 C (167 F) for dry, damp, and wet locations.

B. #10 & #12 branch circuit conductors shall be solid, all else shall be stranded.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRES AND CABLES:

A. General: Install electrical cables, wires and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UL, and NECA's "Standard of Installation" and in accordance with recognized industry practices.

B. Unless otherwise noted, all branch circuit conductors shall be No. 12 AWG.

C. Refer to sheet E-101 for branch circuit conductor adjustments to be made due to length of run.

D. Leave a minimum of 8" slack wire in every outlet box.

E. Install pull boxes in circuits or feeders over 100' long.

F. Make all splices and connections only at outlet, pull or junction boxes. All splice boxes shall be accessible.

G. Install UL Type THWN/ THHN wiring in conduit, for feeders and branch circuits.

H. Pull conductors simultaneously where more than one is being installed in same raceway.

I. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulation.

J. Use pulling means including, fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.

K. Keep conductor splices to minimum.

L. Install splices and tapes which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced. Use splice and tap connectors which are compatible with conductor material.

3.02 FIELD QUALITY CONTROL:

A. Prior to energizing of circuitry, check installed feeder wires and cables with mega ohm meter to determine insulation resistance levels to ensure requirements are

fulfilled. A list of feeders tested shall be submitted to the engineer indicating the insulation resistance level for each cable.

B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.

C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION 16120

SECTION 16135
ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is a part of each Division 16 section making reference to electrical wiring boxes and fittings specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings specified in this Section include the following:

1. Outlet boxes.
2. Junction boxes.
3. Pull boxes.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.

D. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

PART 2 - PRODUCTS

2.01 FABRICATED MATERIALS:

A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides.

1. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations.

2. Ceiling boxes shall be four inch (4") square or octagonal, one and one-eighth inch (1-1/8") deep for exposed work or furred ceiling work and three inches (3") deep for concrete work. Plaster rings and/or fixture studs shall be provided where required.

B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

1. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations.

2. Flush mounted wall outlets shall be four inch (4") square boxes or gang boxes, not less than one and one-half inches (1-1/2") deep. Boxes shall be provided with extension rings and/or covers with sufficient depth to bring the covers flush with the finished wall.

3. Boxes for flush mounting in concrete block work with one or two devices shall have covers with square corners on the raised portion of the cover. The covers shall have a sufficient amount of depth to be flush with the face of the block. Covers shall be Steel City 52-C series. Boxes for more than two devices shall be Steel City "GW" gang boxes. The bottom side of the covers or boxes shall be installed at the masonry course nearest to the dimension specified or noted.

4. Outlet boxes for exposed wall mounting and outdoor installation shall be cast metal type "FS" or "FD" boxes with suitable cast aluminum covers. Weatherproof receptacle covers shall have spring hinged lids.

C. Rain-tight Outlet Boxes: Provide corrosion-resistant cast-metal rain-tight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

D. Junction and Pull Boxes: Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

E. Floor Boxes: Provide PVC rain-tight adjustable floor boxes as indicated, with vertical adjusting rings, gaskets, brass floor plates with flush screw-on covers with ground flange and stainless steel cover screws.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/ cable, wiring devices, and raceway installation work.

C. Provide weather-tight outlets for interior and exterior locations exposed to weather or moisture.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring. All existing and new junction boxes within the project area shall be made accessible. Relocate existing junction boxes as required to comply with the NEC.

F. Metallic electrical outlet boxes may be installed in vertical fire resistive assemblies classified as 2 hour or less without affecting the fire classification, provided such openings occur on one side only in each framing space and that openings do not exceed 16 square inches. Boxes located opposite sides of walls or partitions shall be separated by a horizontal distance of 24 inches.

G. In openings larger than sixteen (16) square inches, the wall shall be built around openings so as not to interfere with the integrity of the wall rating.

H. All clearances between such boxes and the gypsum board shall be completely filled with joint compound or other approved material.

I. Position recessed outlet boxes accurately to allow for surface finish thickness.

J. Set floor boxes level and flush with finish flooring material.

K. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

L. Subsequent to installation of boxes, protect boxes from construction debris and damage.

M. All power and lighting junction box covers shall be marked with panel and circuit numbers. All other (Fire Alarm, Tele./Data, Secuity, etc.) shall be marked for system type. These markings shall be made with a permanent black marker.

END OF SECTION 16135

SECTION 16142
ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 15 and Division 16 section making reference to electrical connections for equipment specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.

B. Electrical connections for equipment, not furnished as integral part of equipment, are specified in Division 15 and other Division 16 sections, and are work of this Section.

C. Motor starters and controllers, not furnished as integral part of equipment, are specified in applicable Division 16 sections, and are work of this Section.

D. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this Section.

E. Electrical identification for wire/cable conductors is specified in Division 16 section, "Electrical Identification", and is work of this Section.

F. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this Section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials,

including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firms with at least two (2) years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.

C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.

D. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use With Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and -labeled.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS:

A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

B. Metal Conduit, Tubing and Fittings:

1. General: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements and comply with NEC requirements for raceways. Provide products complying with Division 16 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing and fittings:

   a. Rigid steel conduit.
   b. Rigid metal conduit fittings.
   c. Electrical metallic tubing.
   d. EMT fittings.
   e. Flexible metal conduit.
   f. Flexible metal conduit fittings.
   g. Liquid-tight flexible metal conduit.
   h. Liquid-tight flexible metal conduit fittings.

C. Wires, Cables, and Connectors:

1. General: Provide wires, cables, and connectors complying with Division 16 basic electrical materials and methods section "Wires and Cables".

2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F).

D. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

PART 3 - EXECUTION

3.01 OBSERVATION:

A. Observe area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF ELECTRICAL CONNECTIONS:

A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, and NEC to ensure that products fulfill requirements.

B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.

C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

D. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been

successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

E. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.

F. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

G. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.

H. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.

I. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:

1. Exterior location.
2. Moist or humid atmosphere where condensate can be expected to accumulate.
3. Corrosive atmosphere.
4. Water spray.
5. Dripping oil, grease, or water.

3.03 FIELD QUALITY CONTROL:

A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION 16142

SECTION 16143
WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to wiring devices specified herein.

1.02 DESCRIPTION OF WORK:

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this Section include the following:

1. Receptacles.
2. Ground-fault circuit interrupters.
3. Switches.
4. Wallplates.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical wiring devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Installer's Qualifications: Firm with at least two (2) years of successful installation experience on projects utilizing wiring devices similar to those required for this project.

C. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.

D. UL Compliance: Provide wiring devices which are UL-listed and labeled.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, manufacturers providing wiring devices which may be incorporated in the work include, but are not limited to, the following (for each type and rating of wiring device):

1. Leviton Manufacturing Co. Inc.
2. Arrow-Hart, Cooper Industries
3. General Electric Co.
4. Harvey Hubbell Inc.
5. Pass and Seymour Inc.

2.02 FABRICATED WIRING DEVICES:

A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub/No. WD 1. Device colors as the architect requires.

B. Receptacles:

1. All receptacles shall be the grounding type with ground connection made through an extra pole which shall be permanently connected to the green grounding conductor.

2. Duplex receptacles for 20 ampere, 120 volt service shall be two-pole, three-wire receptacles rated 20 amperes at 125 volts. Receptacles shall be Leviton, catalog No. 5362-X.

3. Single receptacles for 20 amps, 120 volts service shall be two-pole, three-wire rated 20 amperes at 125 volts. Receptacles shall be Leviton, catalog No. 5361-X.

4. Ground-fault interrupters shall be Leviton, Catalog No. M7899-X.

5. Isolated grounding type shall be Leviton No. 5362-IG.

C. Switches:

1. Snap: Provide toggle switches, rated 20 amperes at 120/277 volts, grounding type, quiet type and shall be UL approved without derating for tungsten lamp loads or inductive loads. Device color as the architect requires.

Type	Catalog No.
Single Pole	1221-I
Three Way	1223-I
Four Way	1224-I

2.03 WIRING DEVICE ACCESSORIES:

A. Wallplates: Provide wallplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Wallplates shall be .030 satin stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES:

A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Where receptacles are shown to be mounted of above counter, refer to Architectural Drawings for cabinet locations and mount receptacle box to clear backsplash of all counters by a minimum of two inches.

C. Install device plates in full contact with wall surface or surface mounted box.

D. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.

E. Install wiring devices after wiring work is completed.

F. Install wallplates after painting work is completed.

3.02 PROTECTION OF WALLPLATES AND RECEPTACLES:

A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of substantial completion,

replace those items which have been damaged, including those burned and scored by faulty plugs.

3.03 GROUNDING:

A. Provide equipment grounding connections for all wiring devices, unless otherwise indicated.

3.04 TESTING:

A. Prior to energizing circuitry, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 16143

SECTION 16170
CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to wiring devices specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of circuit and motor disconnect switch work is indicated on drawings and schedules.

B. Types of circuit and motor disconnect switches in this Section include the following:

1. Equipment disconnects.
2. Appliance disconnects.
3. Motor-circuit disconnects.

C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division 16 Basic Electrical Materials and Methods sections.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required, whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.

D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches." Provide circuit and motor disconnect switches which have been UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds. Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)."

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include, but are not limited to, the following (for each type of switch):

1. General Electric Co.
2. Square D Company.
3. Westinghouse Electric Corp.
4. Siemens.

2.02 FABRICATED SWITCHES:

A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, NEMA HD sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated; incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips.

1. All fuses for safety switches shall be dual element, cartridge type. Fuses shall be by one manufacturer: Bussman "Fusetron" or Chase-Shawmut "Trionic." The Contractor shall furnish and install proper size fuses where required for all fusible equipment and shall furnish to the Owner one spare fuse for each fuse installed.

PART 3 - EXECUTION

3.01 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES:

A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Install disconnect switches for use with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.

C. Unless otherwise indicated, protective devices shall be mounted with top of cabinet or enclosure six feet and six inches (6'-6") above finished floor, shall be properly aligned, and shall be adequately supported independently of the connecting raceways. All steel shapes, etc., necessary for the support of the equipment shall be furnished and installed where the building structure is not suitable for mounting the equipment directly thereon. Unless otherwise indicated, all branch circuit protective devices enclosures shall be NEMA type I, general purpose type. Branch circuit protective devices installed outdoors or exposed to the weather shall have weatherproof enclosures, NEMA type 3R or type 4.

3.02 GROUNDING:

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.03 FIELD QUALITY CONTROL:

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

END OF SECTION 16170

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SECTION 16190
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is a part of each Division 16 section making reference to electrical supporting devices specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of supports, anchors, sleeves and seals is indicated by drawings and schedules and/or specified in other Division 16 sections.

B. Types of supports, anchors, sleeves and seals specified in this Section include the following:

1. Clevis hangers.
2. One-hole conduit straps.
3. Two-hole conduit straps.
4. Round steel rods.
5. Expansion anchors.
6. Toggle bolts.
7. Wall and floor seals.
8. Corn Clamps.

C. Supports, anchors, sleeves and seals furnished as part of factory fabricated equipment, are specified as part of that equipment assembly in other Division 16 sections.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience with projects utilizing electrical supporting device work similar to that required for this project.

C. NECA Compliance: Comply with National Electrical Contractors Association's "Standard of Installation" pertaining to anchors, fasteners, hangers, supports, and equipment mounting.

D. UL Compliance: Provide electrical components which are UL-listed and labeled.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on supporting devices including catalog cuts, specifications, and installation instructions, for each type of support, anchor, sleeve and seal.

PART 2 - PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES:

A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Installer's option.

B. Supports: Provide supporting devices of types, sizes and materials indicated; and having the following construction features:

1. Clevis Hangers: For supporting metal conduit; galvanized steel; with one-half inch (1/2") diameter hole for round steel rod; approximately 54 pounds per 100 units.

2. Reducing Couplings: Steel rod reducing coupling, one-half inch (1/2") by five-eighths inch (5/8"); approximately sixteen (16) pounds per hundred (100) units.

3. One-Hole Conduit Straps: For supporting metal conduit; galvanized steel; approximately 7 pounds per 100 units.

4. Two-Hole Conduit Straps: For supporting metal conduit, galvanized steel.

5. Hexagon Nuts: For one-half inch (1/2") rod size; galvanized steel; approximately 4 pounds per 100 units.

6. Round Steel Rod: One-half inch (1/2") diameter; approximately sixty-seven (67) pounds per hundred feet (100').

7. Offset Conduit Clamps: For supporting two inch (2") rigid metal conduit; galvanized steel; approximately two hundred (200) pounds per hundred (100) units.

8. Tie wire is not an acceptable conduit support

C. Anchors: Provide anchors of types, sizes and materials indicated, with the following construction features:

1. Expansion Anchors: One-half inch (1/2"); approximately thirty-eight (38) pounds per hundred (100) units.

2. Toggle Bolts: Springhead; three-sixteenths inch (3/16") by four inch (4"); approximately five (5) pounds per hundred (100) units.

D. Sleeves and Seals: Provide sleeves and seals, of types, sizes and materials indicated, with the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws. Seals shall be fire rated where required.

E. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 12-gauge hot-dip galvanized steel, of types and sizes indicated; construct with nine-sixteenths inch (9/16") diameter holes, eight inch (8") o.c. on top surface, and with the following fittings which mate and match with U-channel:

1. Fixture hangers.
2. Channel hangers.
3. End caps.
4. Beam clamps.
5. Wiring studs.
6. Thinwall conduit clamps.
7. Rigid conduit clamps.
8. Conduit hangers.

2.02 FABRICATED SUPPORTING DEVICES:

A. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

B. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Caulk between sleeve and pipe with nontoxic, UL-classified caulking material to ensure watertight seal. Seals shall be fire rated where required.

PART 3 - EXECUTION

3.01 INSTALLATION OF SUPPORTING DEVICES:

A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements. Tie wire is not an acceptable conduit support.

END OF SECTION 16190

SECTION 16195
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. This Section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to wiring devices specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical identification work is indicated by drawings and schedules.

B. Types of electrical identification work specified in this Section include the following:

1. Equipment/system identification signs.

PART 2 - PRODUCTS

2.01 ELECTRICAL IDENTIFICATION MATERIALS:

A. Engraved Plastic-Laminate Signs:

1. General: Provide engraving stock melamine plastic laminate, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

2. Signs shall be black face with white core plies (letter color).

a. Thickness: One-sixteenth inch (1/16"), except as otherwise indicated.

b. Lettering shall be 3/8".

c. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.02 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide

numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION:

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.

2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Equipment/System Identification:

1. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

   a. Panelboards, electrical cabinets and enclosures.
   b. Access panels/doors to electrical facilities.
   c. Transformers.
   d. Telephone switching equipment.

2. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION 16195

SECTION 16452
GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. Division 16 Basic Materials and Methods sections apply to work of this Section.

1.02 SUMMARY:

A. The extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.

B. The type of electrical grounding and bonding work specified in this Section includes the following:

1. Solidly grounded.

C. Applications of electrical grounding and bonding work in this Section include the following:

1. Electrical power systems.
2. Grounding electrodes.
3. Separately derived systems.
4. Raceways.
5. Service equipment.
6. Enclosures.
7. Equipment.
8. Lighting standards.
9. Landscape lighting.
10. Signs.

D. Refer to other Division 16 sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this Section.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.

1.04 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.

2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869, "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING:

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC and UL, requirements and with established industry standards for those applications indicated.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.

C. Bonding Plates, Connectors, Terminals and Clamps: Provide electrical bonding plates, connectors, terminals, lugs and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for indicated applications.

D. Ground Electrodes:

1. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core, three-fourths inch (3/4") diameter by ten feet (10').

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS:

A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

C. Ground electrical service system neutral at service entrance ground bus to tripoise (3) driven ground rods (3/4" x 10') arranged 10' equidistant and interconnected with code sized grounding conductor. Connect another code sized bare copper conductor to the main water service metallic entrance ahead of cut-off valve. This same conductor shall be bonded to the building steel.

D. Ground each separately-derived system neutral to:

1. Ground bus location as drawings indicate.

E. Connect together service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

1. The neutral of all transformers shall be grounded to the grounding electrode conductor.

2. All raceways shall be provided with a No. 12 AWG green grounding conductor unless otherwise indicated. Equipment ground conductor shall be connected to ground bus in panelboard. Refer to E-101 for grounding conductor adjustments to be made due to length of run.

F. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing. Conductors looped under screw or bolt heads will not be permitted.

G. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.

H. Provide a grounding bushing and a continuous copper bonding jumper from the bushing to the equipment ground bus in all feeders. The bonding jumper shall be the same size as the equipment ground conductor.

I. No more than one grounding connector shall be inserted in any lug or terminal on a terminal strip unless terminal strip is rated for application.

3.03 FIELD QUALITY CONTROL:

A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over twenty five (25) ohms, take appropriate action to reduce resistance to five (5) ohms, or less, by driving additional ground rods; then retest to demonstrate compliance. Send test date and ohm readings to Architect at the test conclusion.

END OF SECTION 16452

SECTION 16470
PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplemental General Conditions and Division 1 Specification sections, apply to work of this Section.

B. Division 16 Basic Electrical Materials and Methods sections apply to work specified in this Section.

1.02 SUMMARY:

A. Extent of panelboard and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules, and as specified herein.

B. Types of panelboards and enclosures required for the project include the following:

1. Lighting and appliance panelboards.

C. Refer to other Division 16 sections for wires/cables, electrical boxes and fittings, and raceway work required in conjunction with installation of panelboards and enclosures.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's data on panelboards and enclosures. Shop drawings shall indicate arrangement of busses, branch circuits, enclosures, dimensions, etc.

1.04 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: A firm with at least three (3) years of successful installation experience on projects utilizing panelboards similar to those required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Article 384 as applicable to installation, and construction of electrical panelboards and enclosures.

2. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards", and UL codes 50, 869, and 1053 pertaining to panelboards, accessories and enclosures. Provide panelboard units which are UL listed and labeled.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electrical panelboard products which may be incorporated in the work include, but are not limited to, the following:

1. General Electric Co.
2. Siemens.
3. Square D Co.
4. Eaton Corporation; Culter Hammer Products

2.02 PANELBOARDS:

A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.

B. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangements shown; with anti-burn solderless pressure type lug connectors approved for use with copper conductors: equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

1. Panelboards shall be General Electric AQ-Series, Square D type "NQOD" or "NF", Siemens type "S1" or "S2" or Cutler Hammer Type POW-R-Line 2. Panelboard boxes shall be five and three-fourths inches (5-3/4") deep.

C. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge, minimum 16-gauge thickness. Cabinets shall be furnished without knock-outs and all holes for raceways shall be drilled and punched on the job. Panelboard enclosures shall be five and three-fourths inches (5-3/4") deep. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed mounting. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.

D. All panelboards shall be connected distributed phase with circuit numbering as indicated on the drawings. Panelboards shall be numbered with odd numbers on the left side of the panel and even numbers on the right side of the panel. Panelboards shall have a circuit directory card mounted in a frame with plastic cover mounted on the inside of the door, and directory cards shall be completed with a typewriter to indicated areas and/or devices served by each circuit. All new and existing panelboards being used for this project shall have new typed directories.

E. Molded-Case Circuit Breakers: Provide factory-assembled, bolt-on, molded-case circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated. Multi-pole breakers shall have a common trip bar so that the tripping of one pole will automatically trip all poles of the breaker. Construct with over-center, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position, and operating in an ambient temperature of 40°C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. All circuit breakers shall be fully rated, series rated is not acceptable.

F. Panelboards shall be installed complete with connectors and associated hardware for all circuit breakers and circuit breaker spaces listed in the panelboard schedule.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF PANELBOARDS:

A. Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Panelboards or any other electrical equipment located in smoke or fire rated walls shall be mounted on Unistrut channels. Channels shall be supported from floor and structure above ceiling. There shall be no penetrations of the fire rated assembly pursuant to the equipment installation.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

D. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.

E. Provide engraved nameplates as specified in section 16195 on all lighting and power panels indicating the panel designation.

F. Provide engraved nameplates for all breakers on power panelboards. Indicate the device, panel, or motor being served. Secure nameplates to panelboard trim with two round-head sheet metal screws.

G. Provide lock-on devices for installation of critical circuits such as fire alarm notification circuit expander panels.

3.03 GROUNDING:

A. Provide equipment grounding connections for panelboard enclosures as indicated.

B. Prior to energization, check panelboards for electrical continuity of circuits, and for short-circuits.

3.04 ADJUSTING AND CLEANING:

A. Adjust operating mechanisms for free mechanical movement.

B. Touch-up scratched or marred surfaces to match original finishes.

END OF SECTION 16470

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SECTION 16999 – LIGHTING FIXTURE CUT SHEETS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Type “A” fixture
2. Type “B” fixture
3. Type “C” fixture
4. Type “D” fixture
5. Type “E” fixture
6. Type “F” fixture
7. Type “X” fixture

END OF SECTION 16999

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