PCB Conservation Park Classroom Building

PCB23-35 ITB

PROJECT NO. 21075

DAG ARCHITECTS INC
455 Harrison Av, Suite I Panama City FL 32401
Telephone: 850.387.1681

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SECTION 000030
BID PROPOSAL FORM

This proposal of_____(hereinafter called "BIDDER"), organized and existing under the laws of the State of_____, doing business as_____ (a corporation, a partnership or an individual), whose Florida contractor's license number is_____is hereby submitted to the CITY OF PANAMA CITY BEACH (hereinafter called "OWNER").

In compliance with the requirements of the Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the **PCB23-35 ITB CONSERVATION PARK CLASSROOM BUILDING PROJECT** in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID, each party thereto certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under the CONTRACT DOCUMENTS within ten (10) calendar days after the NOTICE TO PROCEED to be issued by Owner in writing and achieve Substantial Completion of the WORK within **Two Hundred and Seventy** (270) consecutive calendar days from Notice to Proceed Date.

Final Completion of the WORK shall be achieved by BIDDER within the calendar days specified in the General Conditions after the date of Substantial Completion.

BIDDER further agrees to pay as liquidated damages, the sum of $500.00 for each consecutive calendar day that expires after the Contract Time until Substantial Completion of the WORK is achieved as provided in Section 15 of the General Conditions.

BIDDER acknowledges receipt of the following ADDENDA:

Addendum No.1 _____

Addendum No.2 _____

Addendum No.3 _____

Addendum No.4 _____

BASE BID

BIDDER agrees to perform all the WORK described in the CONTRACT DOCUMENTS for the following lump sum:_____.

The BIDDER proposes and agrees, if this Proposal is accepted, to contract with the OWNER in the required form of the Agreement, Section 00050, to furnish allnecessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the WORK in full and in accordance with the shown, noted, described and reasonably intended requirements of the CONTRACT DOCUMENTS according to the following schedule:

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
BASE BID					
1	MOBILIZATION	LS	1		$
2	NEW CLASSROOM BUILDING – INCLUDES BUILDING AND RELATED SITEWORK	LS	1		$
3	HOLD HARMLESS	LS	1		$10.00
4	TESTING ALLOWANCE			ALLOWANCE	$10,000.00
				TOTAL BASE BID:	$

ADDITIVE ALTERNATES					
1	ADD ALTERNATE 1 – FURNITURE FIXTURES & EQUIPMENT (FF&E) – INCLUDES OFFICE FURNITURE AND KITCHEN APPLIANCES	LS	1		$
2	ADD ALTERNATE 2 – EXISTING BUILDING LIGHTING REPLACEMENTS	LS	1		$
TOTAL BASE BID + ADD ALTERNATE 1:					$
TOTAL BASE BID + ADD ALTERNATE 2:					$
TOTAL BASE BID + ADD ALTERNATE 1+ ADD ALTERNATE 2:					$

The undersigned bidder is licensed in accordance with the requirements of the State of Florida. Contractor will also include a copy of sub-contractor's license upon award of bid.

_____ _____
(Name of Holder) (Certificate Number)

FIRM: _____

BY: _____
(SINGATURE)

_____
(PRINTED NAME)

TITLE: _____

ADDRESS: _____

_____
CITY, STATE ZIP

_____
EMAIL ADDRESS

_____
PHONE

SECTION 000040
BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned, _____, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Panama City Beach, as OWNER, in the penal sum of (_____) for the payment of which, will and truly be made, we hereby jointly and severally bind ourselves, successors and assigns. Signed this_____day of _____ , 20__.

The Condition of the above obligation is such that whereas the principal has submitted to the OWNER a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the construction of the **PCB23 – 35 ITB PCB Conservation Park Classroom Building**

NOW THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver the Agreement in the form of contract as set forth in Section 00050 (properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform its obligations created by OWNER's acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

(c) NOW, THEREFORE, if the OWNER shall accept the BID of the Principal and the Principal shall execute and deliver to OWNER the required Agreement and within ten days after the date of a written Notice of Award in accordance with the terms of such BID, and within said ten days deliver to OWNER the required Certificates(s) of Insurance, together with the required Performance and Payment Bonds in an amount of 100% the total Contract Amount as specified in the Bidding Documents or Contract Documents with good and sufficient surety for the faithful performance of the Agreement and for the prompt payment of labor, materials and supplies furnished in the prosecution thereof or, in the event of the failure of the Principal to execute and deliver to OWNER such Agreement or to give such bond or bonds, and deliver to

the fixed penal sum of (_____) noted above as liquidated damages, and not as a penalty, as provided in the Instructions for Bidders, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may have to accept said BID; and Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
Principal

_____
Surety

By:

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Florida.

END OF SECTION 000040

SECTION 00050

AGREEMENT

THIS AGREEMENT is made this _____ day of _____, 2023,by and between THE CITY OF PANAMA CITY BEACH, FLORIDA, (hereinafter called "OWNER") and _____ doing business as a _____ (an individual), or (a partnership), or (a corporation), having a business address of _____ (hereinafter called"CONTRACTOR") , for the performance of the Work (as that term is defined below) in connection with the construction of **PCB23-35 ITB PCB CONSERVATION PARK CLASSROOM BUILDING** ("Project"), to be located at the terminus of Griffin Road, Panama City Beach, Florida 32413,, in accordance with the Drawings and Specifications prepared by DAG Architects, Inc., the Architect of Record (hereinafter called "Engineer") and all other Contract Documents hereafter specified.

OWNER and CONTRACTOR, for the consideration herein set forth, agree as follows:

1. The CONTRACTOR shall furnish, at its sole expense, all supervision, labor,equipment, tools, material, and supplies to properly and efficiently perform allof the work required under the Contract Documents and shall be solely responsible for the payment of all taxes, permits and license fees, labor fringe benefits, insurance and bond premiums, and all other expenses andcosts required to complete such work in accordance with this Agreement (collectively the "Work"). CONTRACTOR'S employees and personnel shallbe qualified and experienced to perform the portions of the Work to which they have been assigned. In performing the Work hereunder, CONTRACTOR shall be an independent contractor, maintaining control over and having sole responsibility for CONTRACTOR'S employees and other personnel. Neither CONTRACTOR, nor any of CONTRACTOR'S sub-contractors or sub-subcontractors, if any, nor any of their respective employees or personnel, shall be deemed servants, employees, or agents of OWNER.

2. The CONTRACTOR will commence the Work required by the Contract Documents within ten (10) calendar days after the date of the NOTICE TOPROCEED to be issued

by OWNER in writing thirty (30) days from the dateof this Agreement and will **achieve Substantial Completion of the Work within Two Hundred and Seventy (270) Calendar Days of the required commencement date,** except to the extent the period for Substantial Completion is extended pursuant to the terms of the Contract Documents ("Contract Time"). Final Completion of the Work shall be achieved by CONTRACTOR within the time period set forth in Section 15.2 of Section 00100, General Conditions.

3. The CONTRACTOR agrees to pay the OWNER, as liquidated damages, thesum of $ 500.00 for each calendar day that expires after the Contract Timefor Substantial Completion as more fully set forth in Section 15 of the General Conditions.

4. The CONTRACTOR agrees to perform all of the Work described in the Contract Documents and comply with the terms therein for the sum of $ _____as shown in the BIDSCHEDULE, included within the Bid Proposal Form, as said amount may behereafter adjusted pursuant to the terms of the Contract Documents ("Contract Price").

5. The term "Contract Documents" means and includes the following documents, all of which are incorporated into this Agreement by thisreference:

Section 00010	ADVERTISEMENT FOR BIDS
Section 00020	INFORMATION FOR BIDDERS
Section 00030	BID PROPOSAL FORM
Section 00040	BID BOND
Section 00050	AGREEMENT
Section 00060	PERFORMANCE BOND
Section 00070	PAYMENT BOND
Section 00080	NOTICE OF AWARD
Section 00090	NOTICE TO PROCEED
Section 00092	CONFLICT OF INTEREST
Section 00093	NON-COLLUSION AFFIDAVIT
Section 00095	STATEMENT UNDER SECTION 287.087, FLORIDA STATUTES, ON PREFERENCE TO BUSINESSES WITH DRUG-FREE WORKPLACE PROGRAMS

Section 00096	TRENCH SAFETY ACT CERTIFICATE OF COMPLIANCE
Section 00097	PUBLIC ENTITY CRIMES STATEMENT
Section 00098	E-VERIFY FORM
Section 00099	CERTIFICATE OF INSURANCE
Section 00100	GENERAL CONDITIONS
Section 00800	SUPPLEMENTAL CONDITIONS
Section 00801	SUBMISSION OF WORK SCHEDULE
Section 00802	PREVENTION, CONTROL AND ABATEMENT OF EROSION AND WATER POLLUTION
Section 00808	SALES TAX EXEMPTION

DRAWINGS prepared by DAG Architects, numbered G-001 through T-301 and dated March 15, 2023_____ SPECIFICATIONS prepared or issued by DAG dated March 15, 2023.

ADDENDA

No. 1, dated_____, 2023

No. 2, dated_____, 2023

No. 3, dated_____, 2023

No. 4, dated_____, 2023

The Contract Documents also includes any written amendments to any of theabove signed by the party to be bound by such amendment. The Contract Documents are sometimes referred to herein as the “Agreement”.

6. The OWNER will pay the Contract Price to the CONTRACTOR in the mannerand at such times as set forth in Contract Documents.

7. This Agreement shall be binding upon all parties hereto and their respectiveheirs, executors, administrators, successors, and assigns.

8. This Agreement shall be governed by the laws of the State of Florida.

9. All notices required or made pursuant to this Agreement shall be in writing and, unless

otherwise required by the express terms of this Agreement, maybe given either (i) by mailing same by United States mail with proper postageaffixed thereto, certified, return receipt requested, or (ii) by sending same byFederal Express, Express Mail, Airborne, Emery, Purolator or other expeditedmail or package delivery, or (iii) by hand delivery to the appropriate addressas herein provided. Notices to OWNER required hereunder shall be directedto the following address:

If to Owner:

City of Panama City Beach
17007 Panama City Beach Parkway
Panama City Beach, FL 32413
ATTENTION: Drew Whitman, City Manager
Fax No.: (850) 233-5108

If to Contractor:

.
ATTENTION:
Fax No.:

Either party may change its above noted address by giving written noticeto the other party in accordance with the requirements of this Section.

10. CONTRACTOR recognizes that OWNER is exempt from sales tax and maywish to generate sales tax savings for the Project. Accordingly, to the extentdirected by and without additional charge to OWNER, CONTRACTOR shall comply with and fully implement the sales tax savings program as more fullydescribed in the Sales Tax Exemption Addendum. If required by OWNER, the Sales Tax Exemption Addendum shall be made a part of the Contract Documents, the form of which is set forth in Section 00808.

11. The failure of OWNER to enforce at any time or for any period of time any one or more of the provisions of the Agreement shall not be construed to beand shall not be a

continuing waiver of any such provision or provisions or ofits right thereafter to enforce each and every such provision.

12. Each of the parties hereto agrees and represents that the Agreement comprises the full and entire agreement between the parties affecting the Work contemplated, and no other agreement or understanding of any nature concerning the same has been entered into or will be recognized, and that all negotiations, acts, work performed, or payments made prior to the execution hereof shall be deemed merged in, integrated and superseded by this Agreement.

13. Should any provision of the Agreement be determined by a court with jurisdiction to be unenforceable, such a determination shall not affect the validity or enforceability of any other section or part thereof.

14. Unless the context of this Agreement otherwise clearly requires, referencesto the plural include the singular, references to the singular include the plural.The term “including” is not limiting, and the terms “hereof”, “herein”, “hereunder”, and similar terms in this Agreement refer to this Agreement as awhole and not to any particular provision of this Agreement, unless stated otherwise. Additionally, the parties hereto acknowledge that they have carefully reviewed this Agreement and have been advised by counsel of their choosing with respect thereto, and that they understand its contents and agree that this Agreement shall not be construed more strongly against any party hereto, regardless of who is responsible for its preparation.

15. For this Project, OWNER has designated a Project Representative to assistOWNER with respect to the administration of this Agreement. The Project Representative to be utilized by OWNER for this Project, shall be Jim Tatum Associate Principal, DAG Architects.

16. CONTRACTOR acknowledges and agrees that no interruption, interference, inefficiency, suspension or delay in the commencement or progress of the Workfrom any cause whatever, including those for which the OWNER, PROJECT REPRESENTATIVE, or ENGINEER may be responsible, in whole or in part, shall relieve CONTRACTOR of its duty to perform or give rise to any right to damagesor additional

compensation from OWNER. CONTRACTOR expressly acknowledges and agrees that it shall receive no damages for delay. CONTRACTOR‘s sole remedy, if any, against OWNER will be the right to seekan extension to the Contract Time; provided, however, the granting of any suchtime extension shall not be a condition precedent to the aforementioned “No Damage For Delay” provision. This section shall expressly apply to claims for early completion, as well as to claims based on late completion. Notwithstandingthe foregoing, if the Work is delayed due to the fault or neglect of OWNER or anyone for whom OWNER is liable, and such delays have a cumulative total ofmore than 90 calendar days, CONTRACTOR may make a claim for its actual and direct delay damages accruing after said 90 calendar days as provided in Section00805 Supplemental Conditions, Contract Claims and Changes. Except as expressly set forth in this section, in no event shall OWNER be liable to CONTRACTOR whether in contract, warranty, tort (including negligence or strict liability) or otherwise for any acceleration, soft costs, lost profits, special, indirect, incidental, or consequential damages of any kind or nature whatsoever.

17. INSURANCE - BASIC COVERAGES REQUIRED

The CONTRACTOR shall procure and maintain the following described insurance on policies and with insurers acceptable to OWNER. Current Insurance Service Office (ISO) policies, forms, and endorsements or equivalents, or broader, shall be used where applicable.

These insurance requirements shall not limit the liability of the CONTRACTOR. The insurance coverages and limits required of CONTRACTOR under this Agreement are designed to meet the minimum requirements of OWNER and the OWNER does not represent these types or amounts of insurance to be sufficient or adequate to protect the CONTRACTOR'S interests or liabilities. CONTRACTOR alone shall be responsible to the sufficiency of its own insurance program.

The CONTRACTOR and the CONTRACTOR’S subcontractors and sub-subcontractors shall be solely responsible for all of their property, including but not limited to any materials, temporary facilities, equipment and vehicles, and for obtaining adequate and appropriate insurance covering any damage or loss to such property. The CONTRACTOR and the CONTRACTOR’S sub-contractors

and sub-subcontractors expressly waive any claim against OWNER arising out of or relating to any damage or loss of such property, even if such damage or loss is due to the fault or neglect of the OWNER or anyone for whom the OWNER is responsible. The CONTRACTOR is obligated to include, or cause to be included, provisions similar to this paragraph in all of the CONTRACTOR'S subcontracts and its subcontractors' contracts with their sub-subcontractors.

The CONTRACTOR'S deductibles/self-insured retention's shall be disclosed to OWNER and are subject to OWNER'S approval. They may be reduced or eliminated at the option of OWNER. The CONTRACTOR is responsible for the amount of any deductible or self-insured retention. Any deductible or retention
applicable to any claim or loss shall be the responsibility of CONTRACTOR and shall not be greater than $25,000, unless otherwise agreed to, in writing, by OWNER.

Insurance required of the CONTRACTOR or any other insurance of the CONTRACTOR shall be considered primary, and insurance of OWNER shall be considered excess, as may be applicable to claims or losses which arise out of the Hold Harmless, Payment on Behalf of OWNER, Insurance, Certificates of Insurance and any Additional Insurance provisions of this agreement, contract or lease.

WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY INSURANCE COVERAGE

The CONTRACTOR shall purchase and maintain workers' compensation and employers' liability insurance for all employees engaged in the Work, in accordance with the laws of the State of Florida, and, if applicable to the Work, shall purchase and maintain Federal Longshoremen's and Harbor Workers' Compensation Act Coverage. Limits of coverage shall not be less tan:

$1,000,000	Limit Each Accident
$1,000,000	Limit Disease Aggregate
$1,000,000	Limit Disease Each Employee

The CONTRACTOR shall also purchase any other coverage required by law for the benefit of

employees.

The CONTRACTOR shall provide to OWNER an Affidavit stating that it meets all the requirements of Florida Statute 440.02 (15) (d).

COMMERCIAL GENERAL LIABILITY COVERAGE

CONTRACTOR shall purchase and maintain Commercial General Liability Insurance on a full occurrence form. Coverage shall include, but not be limited to, Premises and Operations, Personal Injury, Contractual for this Agreement, Independent Contractors, Broad Form Property Damage, Products and Completed Operation Liability Coverages and shall not exclude coverage for the "X" (Explosion), "C" (Collapse) and "U" (Underground) Property Damage Liability exposures. Limits of coverage shall not be less than:

Bodily Injury, Property Damage & Personal Injury Liability	$1,000,000 Combined Single Limit Each Occurrence, and
	$2,000,000 Aggregate Limit

The General Aggregate Limit shall be specifically applicable to this Project. The Completed Operations Liability Coverages must be maintained for a period of not less than three (3) years following OWNER'S final acceptance of the project.

The CONTRACTOR shall add OWNER as an additional insured through the use of Insurance Service Office Endorsements No. CG 20.10.10.01 and No. CG 20.37.10.01 wording or equivalent, or broader, an executed copy of which shall be attached to or incorporated by reference on the Certificate of Insurance to be provided by CONTRACTOR pursuant to the requirements of the Contract Documents.

BUSINESS AUTOMOBILE LIABILITY COVERAGE

The CONTRACTOR shall purchase and maintain Business Automobile Liability Insurance as to ownership, maintenance, use, loading and unloading of all of CONTRACTOR'S owned, non-owned, leased, rented or hired vehicles with limits not less than:

Bodily Injury & Property Damage	$1,000,000 Combined Single Limit Each Accident

EXCESS OR UMBRELLA LIABILITY COVERAGE

CONTRACTOR shall purchase and maintain Excess Umbrella Liability Insurance or Excess Liability Insurance on a full occurrence form providing the same continuous coverages as required for the underlying Commercial General, Business Automobile and Employers' Liability Coverages with no gaps in continuity of coverages or limits with OWNER added by endorsement to the policy as an additional insured in the same manner as is required under the primary policies, and shall not be less than $10,000,000,each occurrence and aggregate as required by OWNER.

ADDITIONAL INSURANCE

The OWNER requires the following additional types of insurance.
[Either list any required insurance (e.g. Professional Liability Insurance) or indicate that none is required at this time]

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK.]

IN WITNESS WHEREOF, the parties hereto have executed or caused to be executed by their duly authorized officials, this Agreement in two (2) copies each of which shall be deemed an original on the date first written above.

(SEAL)

OWNER:

CITY OF PANAMA CITY BEACH, FLORIDA

ATTEST:

BY:_____

_____
City Clerk

NAME:_____
(Please type)

TITLE:_____

_____
City Attorney (as to form only)

CONTRACTOR:

ATTEST:

BY:_____

_____

NAME:_____
(Please Type)

NAME_____
(Please Type)

ADDRESS:_____

END OF SECTION 000050

SECTION 000060

PERFORMANCE BOND
BOND NO._____

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor) (Address of Contractor)

a_____, hereinafter called Principal and(Corporation, Partnership, or Individual)

_____
(Name of Surety) (Address of Surety)

hereinafter called Surety, are held and firmly bound unto:

City of Panama City Beach(Name of Owner)

17007 Panama City Beach Parkway, Panama City Beach, Florida 32413(Address of Owner)

hereinafter called OWNER in the total aggregate penal sum of _____ _____ Dollars ($_____) in lawful money of the United States, for payment of which, we bind ourselves, our heirs, personal representatives, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that if the Principal performs its duties,all the undertakings, covenants, terms, and conditions of that certain Contract between the Principal and the OWNER, dated the_____day of_____, 2023, a copy of which is hereto attached and made a part hereof for the construction of:

PCB23-35 ITB
CONSERVATION PARK CLASSROOM BUILDING PROJECT
"PROJECT NAME"

during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the SURETY and during the guaranty period and if the PRINCIPAL shall satisfy all claims and demands incurred under such Contract, and shallfully indemnify and save harmless the OWNER from all costs and damages which it maysuffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlayand expense

which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said SURETY, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed thereunder or the SPECIFICATIONSaccompanying same shall in any way affect its obligation on this BOND, and does herebywaive notice of any such change, extension of time, alteration or addition to the terms ofthe Contract or to WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that it is expressly agreed that the BOND shall be amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the Contract Price more than twenty percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", wherever used in this BOND, and whether referring to this BOND, or the CONTRACT DOCUMENTS, shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER and the PRINCIPAL shall abridge the rights of OWNER hereunder. The OWNER is the onlybeneficiary hereunder.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK.]

IN WITNESS WHEREOF, this instrument is executed in **three (3)** counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

_____
Principal

_____
(Principal) Secretary

(SEAL) BY _____

_____
(Address)

_____

_____
Witness as to

_____
Principal(Address)

_____

_____
(Surety)

ATTEST:

_____ BY _____
Witness to Surety Attorney-In-Fact

_____ _____
(Address) (Address)

_____ _____

NOTE: Date of BOND must not be prior to date of Contract.
Contractor's Surety shall use this form along with their personal documentation.

If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state of Florida.

END OF SECTION 000060

SECTION

000070

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a_____, hereinafter called Principal and
(Corporation, Partnership, or Individual)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto:

City of Panama City Beach
(Name of Owner)

17007 Panama City Beach Parkway, Panama City Beach, Florida 32413
(Address of Owner)

hereinafter called OWNER, and unto all persons, firms and corporations who or which may furnish labor, or who furnish materials to perform as described under the Contract and to their successors and assigns in the total aggregate penal sum of _____ _____Dollars ($ _____) in lawful money of the United States, for the payment of which, we bind ourselves, our heirs, personal representatives, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that if the PRINCIPAL properly makes payment to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying

Principal with labor, materials or supplies, used directly or indirectly by the Principal in the prosecution of the WORK provided for under that certain contract between the Principal and the OWNER, dated the_____day of_____, 20__, a copy ofwhich is hereto attached and made a part hereof for the construction of:

PCB23-35 ITB CONSERVATION PARK CLASSROOM BUILDING PROJECT
"PROJECT NAME"

and any authorized extensions or modification thereof, including all amounts due for materials, lubricants, fuel, repairs on machinery, equipment and tools, consumed or usedin connection with the construction of such WORK, and for all labor cost incurred in suchWORK including that by a SUBCONTRACTOR or SUPPLIER of any tier, and to any construction lien holder whether it acquires its lien by operation of State or Federal law; then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, that said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to WORKto be performed thereunder or SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, every suit instituted upon the BOND shall be brought in a courtof competent jurisdiction for the county or circuit in which the Contract was to be performed. Owner shall not be joined as a party in any such suit. The notice and time limits of Section 255.05, Florida Statutes, are incorporated herein.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the Contract Price more than twenty percent so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, or the CONTRACT DOCUMENTS shall include any change, alteration, addition, extension or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the rights of the OWNER hereunder.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK.]

WITNESS WHEREOF, this instrument is executed in **three (3)** counterparts, each one of which shall be deemed an original, this the____day of_____, 20___ .

_____
Principal

_____
(Principal) Secretary

(SEAL) BY _____

_____
(Address)

_____

_____
Witness as to Principal

_____
(Address)

_____

_____
(Surety)

ATTEST:

_____ BY _____
Witness as to Surety Attorney-In-Fact

_____ _____
(Address) (Address)

_____ _____

NOTE: Date of BOND must not be prior to date of Contract.

If CONTRACTOR is partnership, all partners should execute BOND. Contractor's Surety shall use this form along with their personal documentation.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Florida .

END OF SECTION 000070

SECTION 000080

NOTICE OF AWARD

TO: _____
_____
_____

PROJECT DESCRIPTION:

CONSERVATION PARK CLASSROOM BUILDING PROJECT

The City of Panama City Beach ("City") has considered the BID submitted by you for the above-described Project in response to its Advertisement for Bids dated_____, and associated Information for Bidders.

You are hereby notified that your Bid in the amount of **$**_____has been accepted by the City. Provided, however, nothing in this Notice or your delivery to the City of the Agreement executed by you (with the required Bonds and Certificates of Insurance) shall in any manner or way be deemed to create any contract between you and the City. No such contract shall be created unless and until the City signs the Agreement.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance Bond, Payment Bond, and Certificates of Insurance within ten (10) calendar days from the date of this Notice.

If you fail to execute said Agreement, together with the required Certificates of Insurance and Bonds, within ten (10) calendar days from the date of this Notice, City will be entitled to consider all your rights arising out of City's acceptance of your BID as abandoned and as a forfeiture of your Bid Deposit. The City will be entitled to all other rights and remedies as may be available to it at law.

You must return an acknowledged copy of this Notice of Award to the City, with the executed Agreement and required Certificates of Insurance and Bonds, within the above noted ten (10) calendar day period.

Dated this_____day of _____, 20__.

[REMIAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK.]

CITY OF PANAMA CITY BEACH
Owner

By _____

Name: Drew Whitman

Title City Manager

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged

By_____

This the_____day of_____, 20___.

Name_____

Title_____

END OF SECTION 000080

SECTION 000090

NOTICE TO PROCEED

TO: _____
_____
_____

PROJECT DESCRIPTION:

PCB23-35 ITB CONSERVATION PARK CLASSROOM BUILDING PROJECT

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 2023 on or before_____,2023, and you are to substantially complete the WORK within Two Hundred and Seventy (270) consecutive calendar days thereafter. The date of Substantial Completion is therefore _____, 2023.

You must return and acknowledge a copy of this Notice to Proceed to the City within five (5)calendar days of your receipt of this Notice.

CITY OF PANAMA CITY BEACH

By: _____

Name: Drew Whitman

Title City Manager

ACCEPTANCE OF NOTICE
Receipt of the above Notice to Proceed is hereby acknowledged

By_____
(Company Name)

This the_____day of_____, 20____

_____
(Signature)

_____
(Type or Print Name)

_____
(Title)

END OF SECTION 0000900

SECTION 000092

CONFLICT OF INTEREST STATEMENT

Check one:

[ ] To the best of our knowledge, the undersigned Respondent has no potential conflict of interest due to any other clients, contracts, or property interest for this project.

or

[ ] The undersigned Respondent, by attachment to this form, submits information which may be a potential conflict of interest due to other clients, contracts, or property interest for this project. This includes and requires disclosure of any officer, director, partner, proprietor, associate, or agent of the Respondent who is also an officer or employee of the City or of its boards or committees.

LITIGATION STATEMENT

Check one:

[ ] The undersigned Respondent has had no litigation and/or judgements entered against it by any local, state, or federal entity and has had no litigation and/or judgements entered against such entities during the past ten (10) years.

or

[ ] The undersigned Respondent, by attachment to this form, submits a summary and disposition of individual cases of litigation and/or judgements entered by or against any local, state, or federal entity, by any state or federal court, during the past ten (10) years.

COMPANY: _____

SIGNATURE: _____

NAME: _____

TITLE: _____

DATE: _____

Failure to check the appropriate blocks above may result in disqualification of your proposal. Likewise, failure to provide documentation of a possible conflict of interest, or a summary of past litigation and/or judgements, may result in disqualification of your proposal.

END OF SECTION 000092

SECTION 000093

NON-COLLUSION AFFIDAVIT

STATE OF FLORIDA
COUNTY OF_____

_____being, first duly sworn, deposes and says that he is of_____, the party making the foregoing Proposal or Bid; that such Bid is genuine and not collusive or sham: that said bidder is not financially interested in or otherwise affiliated in a business way with any other bidder on the same contract; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidders or person, to put in a sham bid or that such other person shall refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price or affiant or any other bidder, or to fix any overhead, profit or cost element of said bid price, or that of any other bidder, or to secure any advantage against the City of Panama City Beach, Florida, or any person or persons interested in the proposed contract; and that all statements contained in said proposal or bid are true; and further, that such bidder has not directly or indirectly submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

_____
Affiant

Sworn to and subscribed before me this_____day of_____, 2023.

_____
Notary Public

_____
Printed Name

END OF SECTION 000093

"Page Left Intentionally Blank"

SECTION 000095
STATEMENT UNDER SECTION 287.087 FLORIDA STATUTES, ON PREFERENCE TO BUSINESSES WITH DRUG-FREE WORKPLACE PROGRAMS

IDENTICAL TIE BIDS: Preference shall be given to businesses with drug-free workplace programs. Whenever two or more BIDS which are equal with respect to price, quality and service are received by the OWNER for this PROJECT, a bid received from a BIDDER that certifies that it has implemented a drug-free workplace program shall be given preference in the award process. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under BID a copy of the statement specified in paragraph (1).

4. In the statement specified in paragraph (1), notify the employees that, as a condition of working on the commodities or contractual services that are under BID, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace not later than five (5) days after such conviction.

5. Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program is such is available in the employee's community, by an employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this Section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

_____

BIDDER SIGNATURE

END OF SECTION 000095

SECTION 000096

CERTIFICATE OF COMPLIANCE WITH THE FLORIDA TRENCH SAFETY ACT

Bidder acknowledges sole responsibility for complying with the Florida Trench Safety Act (Act). Section 553.60, Florida Statutes. Bidder further acknowledges that included in the various items of its BID and in its Total Lump Sum Bid are costs for complying with the Florida Trench Safety Act. The Bidder further identifies the costs to be summarized below:

	Trench Safety Method (Description)	Units of Measure (LF, SY)	Quantity	Unit Cost	Extended Cost	Unit Extended
A.						
B.						
C.						
D.						

Total $_____

Failure to complete the above may result in your BID being declared non-responsive. The costs indicated above are provided to comply with the Act and shall not constitute grounds for any additional compensation to that listed for the separate line items of the Bid Form.

Bidder_____
By:_____
Its _____

Date _____

_____
Authorized Signature

END OF SECTION 00 009 6

SECTION 00 009 7

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

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS AND SUBMITTED WITH THE BID

1. This sworn statement is submitted to _____

   by _____

   For _____

   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): _____

2. I understand that a “public entity crime” as defined in Section 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, proposal, reply, or contract for goods or services, any lease for real property, or any contract for the construction or repair of a public building or public work, involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

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

3. I understand that "affiliate" as defined in Section 2871.33 (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 a 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.

4. I understand that a "person" as defined in Section 287.133 (1)(e), Florida Statute, means any natural person or any 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 bidsor applies to bid on contracts let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

5. Based on information and belief, the statement which I have marked below is true in relation to the person submitting this sworn statement. [indicate which statement applies.]

_____Neither the person submitting this sworn statement nor any affiliate of the person has been charged with and convicted of a public entity crime causing such person or affiliate to be placed on the convicted vendor list within the last thirty-six (36) months.

_____The person submitting this sworn statement or an affiliate of the person has been charged with and convicted of a public entity crime causing such person or affiliate to be placed on the convicted vendor list within the last thirty-six (36) months.

_____The person submitting this sworn statement or an affiliate of the person has been charged with and convicted of a public entity crime causing such person or affiliate to be placed on the convicted vendor list within the last thirty-six (36) months. However, it has been determined, pursuant to Section 287.133, Florida Statutes, that it was not in the public interest to place the person submitting this sworn statement or its affiliate on the convicted vender list. [Attach a copy of the final order].

6. I understand by my execution of this document, I acknowledge that the person submitting this sworn statement has been informed by the City of Panama City Beach, of the terms of Section 287.133(2)(a) of the Florida Statutes which read as follows:

> "A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017 for CATEGORY TWO for a period of 36 months following the date of being placed on the convicted vendor list."

7. I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH1 (ONE) ABOVE IS FOR THE PUBLIC ENTITY ONLY AND THAT THIS FORM IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR WHICH IT IS FILED. I ALSO UNDERSTAND THAT I AM REQUIRED TO INFORM THE PUBLIC ENTITY IMMEDIATELY OF ANY CHANGE IN THE INFORMATION CONTAINED IN THIS FORM.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK.]

By: _____

Print name: _____

Its: _____

Sworn to and subscribed before me this_____day of_____, 20___.

Personally, known_____OR Produced identification _____

Notary Public- State of _____

My commission expires_____

_____
[printed, typed or stamped
Commissioned Name of Notary Public]

END OF SECTION 000097

SECTION 00 009 9

CERTIFICATE OF INSURANCE

City of Panama City Beach, Florida
Instructions to Agents on Completing the City Certificate of Insurance

The Florida Department of Insurance has approved the general form and substance of the City's Certificate of Insurance form for use in the State of Florida.

In order to prevent unnecessary, follow up work on the Certificate or delay in the start of your insured's active under its contract with the City, please follow these instructions:

1. Complete the City's Certificate of Insurance as required in your insured's contract with the City.
2. Show the full name of your insured as shown in its contract with the City.
3. Show the full names of the Insurance companies providing coverages.
4. Under the General Liability section, show the coverages applicable by checking the appropriate boxes.
5. If required in your insured's contract with the City, the Specific General Aggregate Limit for the Certificates holder's project or locations must be included in the Commercial General Liability Policy and must be shown with a description of the project or location on the line beginning near the bottom of the Certificate titled "Specific Aggregate Liability".
6. Automobile Liability Coverage should be shown as applicable to "any auto" and "hired and non-owned autos" by checking the appropriate boxes.
7. Indicate whether the Excess Liability is written on a "Claims Made" or "occurrence" form. If employers' Liability Coverage is not included, please indicate.
8. Included a brief description of the contract involving your Insured in the space provided under the Description of Operations.
9. The liability policies must include the City of Panama City Beach as additional Insured
10. Complete the signature section, showing the mailing address, telephone number and fax number of the Authorized Representative's name under the signature. Facsimile signature is not acceptable, a manual signature of the Authorized Representative is required.
11. If time is of the essence in submitting this document, you may send a facsimile transmittal; however, you must provide a cover sheet for the document stating the Agent's signature was manually provided and not a "stamped signature and you must follow-up by mailing the original document back to the Department indicated in the lower left corner of the Certificate.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A :	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	CLAIMS-MADE / OCCUR						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
							GENERAL AGGREGATE	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$
	POLICY / PRO-JECT / LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS / NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB / OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$
	DED / RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						WC STATU-TORY LIMITS / OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A					E.L. EACH ACCIDENT	$
							E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER

City of Panama City Beach
17007 Panama City Beach Parkway
Panama City Beach, FL 32413

CANCELLATION

SHOULD ANY OF THE ABOVE-DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

SECTION 000100

GENERAL CONDITIONS

1. Definitions
2. Additional Instructions and Detail Drawings
3. Schedules, Reports and Records
4. Intent of the Contract Documents, Drawings and Specifications
5. Shop Drawings
6. Materials, Services, and Facilities
7. Inspection and Testing
8. Substitutions
9. Patents
10. Surveys, Permits, Regulations, and Project Layout
11. Protection of Work, Property, Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion and Liquidated Damages
16. Correction of Defective Work
17. Suspension of Work, Termination, and Delay
18. Payments to Contractor
19. Acceptance of Final Payment as Release
20. Contract Security
21. Assignments
22. Indemnification
23. Separate Contracts
24. Subcontracting
25. Engineer's Authority
26. Land and Right-of-Ways
27. Guarantee
28. Claims and Disputes
29. Taxes
30. Contract Time, Schedule of the Work, and Time Extensions
31. Use of Site
32. Temporary Facilities
33. Clean Up and Disposal of Waste Materials
34. Warranty of Title
35. Ownership of Hidden Valuable Materials
36. As-Built Plans and Documents to be kept at the Site
37. Silence of Specifications
38. Gratuities
39. Audit and Access to Records
40. Equal Opportunity Requirements
41. Changed Conditions
42. Compliance with Laws
43. Public Entity Crimes
44. Insurance Requirements

11.0 DEFINITIONS

11.1 Unless otherwise expressly noted, wherever used in the Contract Documents the following terms shall have the meanings indicated and shall be applicable to both the singular and plural thereof:

11.2 ADDENDA - Written or graphic instruments, issued by Owner or Engineer prior to the execution of the Agreement, which modify or interpret any of the Contract Documents by additions, deletions, clarifications, or corrections.

11.3 BID - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

11.4 BIDDER - Any person, firm, or corporation submitting a Bid for the Work.

11.5 BONDS - Bid, Performance, and Payment Bonds and other instruments or surety, furnished by the Contractor and the Contractor's surety in accordance with the Contract Documents.

11.6 CHANGE ORDER - A written order to the Contractor issued in accordance with the procedures set forth in the Contract Documents, authorizing an addition, deletion, or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

11.7 CONSTRUCTION CHANGE DIRECTIVE – A Construction Change Directive is a written order prepared by the Engineer and signed by the Owner, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Price or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Agreement, order changes in the Work within the general scope of the Agreement consisting of additions, deletions or other revisions, the Contract Price and Contract Time being adjusted accordingly.

11.8 CONTRACT DOCUMENTS – Collectively the Agreement, Proposal Form, Payment Bond, Performance Bond, General Conditions, Supplemental Conditions, if any, Notice of Award, Notice to Proceed, Drug Free Workplace Program Statement, Trench Safety Act Certificate of Compliance, Public Entity Crimes Statement, Sales Tax Exemption Addendum, Certificate of Insurance, Release and Affidavit from Contractor, Release and Affidavit from Subcontractor, Application and Certificate for Payment, Certificate of Substantial Completion, Contract Change Order(s), Construction Change Directives, Field Orders, Drawings, Specifications and Addenda. The Contract Documents are sometimes referred to herein as the Agreement.

11.9 CONTRACT PRICE - The total compensation payable by Owner to Contractor under the terms and conditions of the Contract Documents.

11.10 CONTRACT TIME - The total period of time beginning with the date of commencement of the Work as authorized by the City and ending on the required date for Substantial Completion of the Work. The Contract Time is set forth with more specificity in Section 2 of the Agreement.

11.11 CONTRACTOR - The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

11.12 CITY or OWNER – The City of Panama City Beach, Florida, acting through its City Council and Charter Officers.

11.13 DRAWINGS - The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

11.14 ENGINEER - The person, firm or corporation named as such in the Agreement.

11.15 FIELD ORDER - A written order effecting a clarification or change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by Engineer or Owner to Contractor during construction.

11.16 NOTICE OF AWARD - The written notice of the acceptance of the Bid from the City to the successful Bidder.

11.17 NOTICE TO PROCEED - Written communication issued by the City to the Contractor authorizing it to proceed with the Work and establishing the date for commencement of the Work.

11.18 OWNER - Same as CITY; same as City of Panama City Beach, Florida.

11.19 PROJECT – The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the City or by separate contractors and is formally known as the **CONSERVATION PARK CLASSROOM BUILDING PROJECT.**

11.20 PROJECT ADMINISTRATION MANUAL (sometimes referred to herein as the “MANUAL”) – The City’s manual of forms and standard administrative procedures regarding project administration. Contractor acknowledges and agrees it has received a copy of the current Manual and shall incorporate any modifications or updates issued by the City into its copy of the Manual to ensure the Manual is kept up to date.

11.21 PROJECT REPRESENTATIVE -The Project Representative shall be the City's representative with respect to the Project and may be a City employee or an outside consultant. The Project Representative shall have authority to transmit instructions, receive information, and interpret and define the City's policies and decisions with respect to the Work. However, except as may be otherwise expressly authorized in writing by the City, the Project Representative is not authorized on behalf of the City to issue any verbal or written orders or instructions to Contractor that would have the affect, or be interpreted to have the affect, of amending or modifying the terms or conditions of the Contract Documents or modifying or amending in any way whatever the: (1) scope or quality of Work to be performed and provided by Contractor as set forth in the Contract Document; (2) the time within which Contractor is obligated to complete the Work; or (3) the amount of compensation the City is obligated or committed to pay Contractor as set forth in the Contract Documents.

11.22 SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

11.23 SPECIFICATIONS - The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

11.24 SUBCONTRACTOR - An individual, firm, or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

11.25 SUBSTANTIAL COMPLETION - That date certified by the Engineer when the Work or an Owner specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Work or the Owner specified part thereof can be utilized by Owner for the purposes for which it is intended.

11.26 SUPPLEMENTAL CONDITIONS - Modifications to the General Conditions required by Owner, set forth in the Section 00800 series of documents.

11.27 SUPPLIER - Any person or organization who supplies materials or equipment for the Work for or on behalf of Contractor, including those fabricated to a special design, but who does not perform labor at the site.

11.28 WORK - The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute

the whole or a part of the Project.

2.0 ADDITIONAL INSTRUCTION AND DETAIL DRAWINGS

2.1 From time to time, Contractor may be furnished additional instructions and detail drawings by the Engineer as necessary to permit Contractor to carry out the Work required by the Contract Documents.

2.2 Any such additional drawings and instructions supplied to Contractor shall be issued as a Field Order. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

3.0 SCHEDULES, REPORTS AND RECORDS

3.1 The Contractor shall submit to the City such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the Contract Documents for the Work to be performed.

3.2 Contractor shall prepare and provide its construction progress schedule ("Construction Schedule") prior to submitting is first Application for Payment, showing the order in which the Contractor proposes to carry on the Work, including dates at which the various parts of the Work will be started, estimated date of completion of each part and, as applicable, the dates at which special drawings will be required and dates for submission of Shop Drawings, the beginning of manufacture, the testing and the installation of materials, supplies and equipment. Further, the Construction Schedule shall not only include the overall progress schedule for the Work to be provided by Contractor hereunder, but also shall include reasonable time periods for Engineer's performance, as accepted by Engineer. The Construction Schedule and any other schedules required by the City hereunder shall be updated monthly. The Construction Schedule and all updates to it shall not exceed the time periods established in the Contract Documents and shall be subject to the City's and Engineer's review and comment. Contractor's submittal of a satisfactory Construction Schedule and updates thereto and the City's acceptance of same shall be a condition precedent to the City's obligation to pay Contractor; provided, however, the acceptance of any such schedule or update by Owner shall not be deemed an admission by Owner that such schedule or update is reasonable, accurate or correct.

3.3 The Contractor shall also submit a schedule of payments, for Owner's review and approval that the Contractor anticipates will be earned during the course of the Work.

4.0 INTENT OF THE CONTRACT DOCUMENTS, DRAWINGS AND SPECIFICATIONS

4.1 It is the intent of the Contract Documents to describe a functionally complete Project (or portion 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 in the Contract Documents. If the Contract Documents include words or terms that have a generally accepted technical or industry meaning, then such words or terms shall be interpreted to have such standard meaning unless otherwise expressly noted in the Contract Documents. Reference to standard specifications, manuals or codes of any technical society, organization or association or to the laws or regulations of any governmental authority having jurisdiction over the Project, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, law or regulation in affect at the time the Work is performed, except as may be otherwise specifically stated herein. Provided, however, in the event the standard specification, manual, code, law or regulation is changed after the Agreement has been executed by the parties, a Change Order shall be issued equitably adjusting the Contract Price and/or Contract Time to the extent such change materially impacts the Contract Time and/or Contract Price.

4.2 Contractor shall perform the Work consistent with the intent of the Drawings, Specifications, and other Contract Documents, and Contractor shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental items necessary to complete the Work in an acceptable manner, ready for use, occupancy or operation by the City.

4.3 Drawings are intended to show general arrangements, design and extent of Work and are not intended to serve as shop drawings. Specifications are separated into divisions for convenience of reference only and shall not be interpreted as establishing divisions for the Work, trades, subcontracts or extent of any part of the Work. In the event of a discrepancy between or among the Drawings, Specifications or other Contract Document provisions, Contractor shall be required to comply with the provision which is the more restrictive or stringent requirement upon Contractor, as determined by the City.

4.4 If during the performance of the Work Contractor discovers a conflict, error or discrepancy in the Contract Documents, including the Drawings and Specifications, Contractor immediately shall report same to Engineer and Owner in writing, and before proceeding with the Work affected thereby, shall obtain a written interpretation or clarification from Engineer. Work done by the Contractor after discovery of such conflict, error, or discrepancy without such written interpretation or clarification from Engineer, shall be done at the Contractor's risk. Prior to commencing the Work, Contractor shall first take all necessary field measurements and verify the applicable field conditions. After

taking such measurements and verifying such conditions, Contractor shall carefully compare such measurements and conditions with the requirements of the Contract Documents, taking into consideration all other relevant information known to Contractor, for the purpose of identifying and bringing to Engineer's and City's attention all conflicts or discrepancies with the Contract Documents. Contractor is solely responsible for verifying all field measurements and conditions.

4.5 Contractor shall comply with the City's standard forms and procedures as set forth in the City's Project Administration Manual relating to Project administration. To the extent there is no form or procedure for a particular matter,then Contractor shall comply with the form or procedure reasonably required bythe City. Once a standard form has been executed by Contractor and Owner asnecessary, the executed copy shall become part of the Contract Documents.

5.0 SHOP DRAWINGS

5.1 The Contractor shall provide shop drawings as may be necessary for the prosecution of the Work as required by the Contract Documents. The Engineer shall promptly review all shop drawings. The Engineer's approval of any shop drawing shall not release the Contractor from responsibility for deviations from the Contract Documents. Any shop drawing which deviates from the requirements of the Contract Documents must be first authorized by a Change Order.

5.2 When submitted for the Engineer's review, shop drawings shall bear the Contractor's certification that it has reviewed, checked and approved the shop drawings and that they are in conformance with the requirements of the Contract Documents.

5.3 Portions of the Work requiring a shop drawing or sample submission shall not begin until the shop drawing or submission has been approved by the Engineer. A copy of each approved shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

6.0 MATERIALS, SERVICES AND FACILITIES

6.1 It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete and deliver the Work within the Contract Time.

6.2 Materials and equipment shall be stored by Contractor to ensure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection.

6.3 Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used cleaned and conditioned as directed by the manufacturer.

6.4 Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

6.5 Materials, supplies and equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest or lien is retained by the seller.

7.0 INSPECTION AND TESTING

7.1 All materials and equipment used in the construction of the Project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents or required by applicable governmental law, rule or regulation.

7.2 The City, Engineer, their respective representatives, agents and employees and governmental agencies with jurisdiction over the Project shall have access at all times to the Work whether the Work is being performed on or off of the Project site, for their observation, inspection and testing. Contractor shall provide proper and safe conditions for such access, and also for any inspection or testing thereof. Contractor shall provide the City and Engineer with timely prior written notice (at least 48 hours) of the readiness of the Work for all required inspections, tests or approvals. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all Work, materials, payrolls, personnel records, material invoices, and other relevant data and records.

7.3 The Contractor shall provide at the Contractor's expense all testing and inspection services required by the Contract Documents or any applicable governmental law, rule or regulation. Re-inspection and re-testing fees and costs of all testing failures shall be at the Contractor's expense.

7.4 If the Contract Documents or any applicable governmental law, rule, or regulation requires any portion of the Work to specifically be inspected, tested, or approved, Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish the Engineer the required certificates of inspection, testing or approval. All inspections, tests or approvals shall be

performed in a manner and by organizations acceptable to the City and Engineer.

7.5 Neither observations by Engineer or the City, nor inspections, tests or approvals by the Engineer or others shall relieve the Contractor from the obligations to perform the Work in accordance with the requirements of the Contract Documents.

7.6 If any Work is covered contrary to the written instruction of the Engineer, it must, if requested by the Engineer, be uncovered for the Engineer's observation and replaced at the Contractor's expense.

7.7 If any Work that is to be inspected, tested or approved pursuant to the Contract Documents or any applicable governmental law, rule or regulation is covered without such inspection, testing or approval having been satisfactorily obtained by Contractor and without obtaining the written concurrence from Engineer, Contractor shall uncover, expose or otherwise make available the Work for such observation, inspection or testing as directed by Engineer, and Contractor shall be responsible for all such costs of uncovering, exposing, observation, inspection, testing, and reconstruction.

7.8 If the Engineer considers it necessary or advisable that covered Work be inspected or tested by others that was not otherwise required to be tested or inspected by the terms of the Contract Documents or any applicable governmental law, rule or regulation, the Contractor, at the Engineer 's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

8.0 SUBSTITUTIONS

8.1 Whenever a material, article, or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue numbers, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function may be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance, quality, and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the

opinion of the Engineer, such material, article, or piece of equipment is of equal substance, quality and function to that specified, the Engineer may allow its substitution and use by the Contractor. If the Contractor based its bid on "or equal" products and the City and/or Engineer determine that one or more of the Contractor's proposed "or equal" products included in its bid fails to meet the requirements of the Contract Documents, Contractor may be required, at City's sole discretion, to provide products conforming with the requirements of the Contract Documents at no additional cost to the City per the City's direction.

8.2 If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall certify that the proposed substitute shall perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. Contractor shall also certify that the evaluation and acceptance of the proposed substitute will not prejudice Contractor's achievement of Substantial Completion of the Work within the Contract Time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for the Project) to adapt the design to the proposed substitute and whether or not incorporation or use by the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service shall be indicated. Contractor shall also provide an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs for redesign and claims of other contractors affected by the resulting change, all of which shall be considered by Engineer in evaluating the proposed substitute. Engineer or Owner may require Contractor to furnish at Contractor's expense additional data about the proposed substitute. Further, Contractor shall reimburse Owner for the changes of Engineer and Engineer's consultants for evaluating each proposed substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the Work while the substitute was undergoing review.

9.0 PATENTS

9.1 The Contractor shall pay all applicable royalties and license fees and shall defend all suits or claims for infringement of any patent rights and save the City harmless from loss on account thereof, except that the City shall be responsible for any such loss when a particular process, design, or product of a particular manufacturer or manufacturers is specified. Provided, however, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, the Contractor shall be responsible for such loss or claim unless the Contractor promptly gives such information in writing to the Engineer and City.

10.0 SURVEYS, PERMITS, REGULATIONS, AND PROJECT LAYOUT

10.1 The City shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of benchmarks adjacent to the Work as shown in the Contract Documents. From the information provided by the City, unless otherwise specified in the Contract Documents, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batten boards, stakes for pipe locations and other working points, lines, elevations and cut sheets.

10.2 The Contractor shall carefully preserve benchmarks, reference points and stakes. Contractor is solely responsible for maintaining all benchmarks, reference points, and stakes, and is solely responsible for any mistake that may be caused by their loss or disturbance. The Contractor shall be held responsible for all mistakes that may be caused by the loss or disturbance of any such benchmarks, reference points or stakes.

10.3 The Contractor shall engage for the performance of Project layout and control, a Professional Land Surveyor registered in the State of Florida to practice land surveying. Said surveyor must carry Professional Liability Insurance in the amount of at least one million dollars ($1,000,000) per occurrence. The land surveyor employed for this Project must comply with the Minimum Technical Standards for Surveying and Mapping pursuant to Florida Statute 472.027.

10.4 Should the Contractor in the course of its Work find that the points, grades and levels which are shown upon the Drawings are not conformable to the physical conditions of the locality at the proposed work or structure, it shall immediately inform the Engineer of the discrepancy between actual physical conditions of the locality of the proposed work, and the points, grades and levels which are shown on the drawings. No claim shall be made by the Contractor against the City for compensation or damage by reasons of failure of the Engineer to represent upon the Drawings points, grades and levels conformable to the actual physical conditions of the locality of the proposed work.

10.5 All permits and licenses necessary for the prosecution of the Work shall be secured and paid for by the Contractor unless otherwise expressly noted in the Contract Documents. These shall include all building permits, burn permits, debris disposal permits, etc. All licenses, easements and variances for permanent structures or permanent changes in existing facilities shall be secured and paid for by the City, unless otherwise specified in the Contract Documents. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and governmental permits and approvals bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the Contract Documents are at variance therewith, the Contractor shall promptly notify the Engineer and City in writing, and any necessary changes shall be adjusted as

provided in Section 13 below.

11.0 PROTECTION OF WORK, PROPERTY, AND PERSONS

11.1 The Contractor is responsible for the safety and protection of all persons and property on or about the Project site during the progress of the Work, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. Further, it is Contractor's responsibility to protect from damage or loss all material and equipment to be incorporated into the Work whether in storage on or off the Project site. Contractor shall initiate, maintain and supervise all safety precautions and programs in connection with the Work and shall develop and implement, in accordance with the requirements of the Contract Documents, a safety plan for the Work. Contractor's safety plan shall include a hurricane protection plan. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as the Work is completed and final acceptance of same by the City has occurred.

11.2 The Contractor will comply with all applicable codes, laws, ordinances, rules, regulations and orders of the City and any public body having jurisdiction over the Work, including the Occupational Safety and Health Administration (OSHA) and any State Safety and Health agency requirements and all of their safety codes, laws, ordinances, rules and regulations. The Contractor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. Contractor shall notify owners of adjacent property and of any underground structures or improvements and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation or replacement of their property. The Contractor will remedy all damage, injury or loss to any property caused by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone of whose acts any of them be liable.

11.3 Barricades, Guards and Safety Provisions: To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards shall be placed and maintained during progress of construction work and until it is safe for both pedestrians and vehicular traffic. Rules and regulations of local authorities regarding safety provisions shall be observed.

11.4 In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instructions or authorization from the Engineer or City, shall act to prevent threatened damage, injury or loss. The Contractor will give the Engineer prompt written notice of any such emergency and to the extent the emergency was not caused by the fault or neglect of Contractor or anyone for whom Contractor is responsible, a Change Order shall be issued covering the necessary and

reasonable changes and deviations involved.

11.5 At all times during the performance of the Work at the Project site, Contractor shall have designated, and located on a full-time basis at the Project site, a qualified individual whose responsibility shall be to monitor and enforce Contractor's safety program at the Project site; such individual shall be deemed to be the Contractor's Project Superintendent. However, Contractor may designate by written notice to the City another individual, reasonably acceptable to the City, who shall be Contractor's safety representative at the Project site.

11.6 Alcohol, drugs and all illegal substances are strictly prohibited on the Project site and any City property. All employees of Contractor, as well as those of all Subcontractors and those of any other person or entity for whom Contractor is legally liable (collectively referred to herein as "Employees"), shall not possess or be under the influence of any such substances while on the Project site or any City property. Further, employees shall not bring on to the Project site or any City property any gun, rifle or other firearm, or explosives of any kind. Provided, however, to the extent explosives are reasonably required with respect to the performance of the Work, Contractor shall strictly comply with the Contract Documents and any and all rules and regulations of Owner or of any applicable governmental agency as it relates to the storage, handling and use of such explosives.

12.0 SUPERVISION BY CONTRACTOR

12.1 The Contractor will supervise and direct the Work. Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will employ and maintain on the Project site on a full-time basis a qualified superintendent acceptable to the City. The superintendent and his or her designees shall have full authority to act on behalf of the Contractor and all communications given to the superintendent or his or her designee shall be as binding as if given to the Contractor. The superintendent or his or her designee shall be present on the site at all times when any portion of the Work is being performed to ensure adequate supervision and coordination of the Work.

13.0 CHANGES IN THE WORK

13.1 The City may at any time during the progress of the Work, as the need arises and in its sole discretion, order changes within the general scope of the Work without invalidating the Agreement. Promptly after being notified of a change, but in no event more than fourteen (14) days after its receipt of such notification (unless the City has agreed in writing to a longer period of time), Contractor shall submit an itemized estimate of any cost or time increases or savings it foresees as a result of the change. Except in an emergency endangering life or

property, no addition or changes to the Work shall be made except upon a properly issued Change Order, Construction Change Directive or Field Order. No officer, employee or agent of the City is authorized to direct any extra or changed work without a properly issued Change Order, Construction Change Directive, or Field Order.

13.2 All changes to the Work must be authorized by means of a written Change Order that is mutually agreed to by the City and Contractor or a Construction Change Directive issued by the City, or a Field Order issued by the City or Engineer. If the change is to be accomplished through a Change Order, the Change Order, in the form set forth in the City's Project Administration Manual, shall be prepared by Contractor, reviewed by Engineer and the City, and executed promptly by the parties after an agreement is reached between Contractor and the City concerning the requested changes. Contractor shall promptly perform changes authorized by duly executed Change Orders. The Contract Price and Contract Time shall be adjusted in the Change Order in the manner as the City and Contractor shall mutually agree. The Change Order shall identify the changed work. Also, where the Contract Price is based upon unit prices, a Change Order may be used for work for which quantities have been altered from those shown in the bidding schedule, as well as decreases or increases in the quantities of installed units which are different than those shown in the bidding schedule because of final measurements. All changes must be recorded on an executed Change Order before they can be included in a monthly Application for Payment.

13.3 To the extent the Contract Price is based on unit prices, the City reserves the right to increase or decrease a unit price quantity as may be deemed reasonable or necessary in order to complete the Work contemplated by this Agreement.

13.4 If the City and Contractor are unable to agree on a Change Order for the requested change, Contractor shall, nevertheless, promptly perform the change as directed by the City in a written Construction Change Directive. In that event, the Contract Price and Contract Time shall be adjusted in the Construction Change Directive as determined by the City. If Contractor disagrees with the City's adjustment determination, Contractor must make a claim strictly in accordance with the terms of the Contract Documents or else be deemed to have waived any claim it might otherwise have had on that matter.

13.5 The City shall have the right to conduct an audit of Contractor's books and records, as well as those of its Subcontractors and Suppliers, to verify the accuracy of Contractor's estimates or claims with respect to Contractor's cost and time impacts associated with any Change Order or Construction Change Directive.

13.8 The Engineer or City at any time may direct Contractor to make changes to the Work by issuing a Field Order, so long as such changes do not require or result in any adjustment to the Contract Price or Contract Time and are generally within the scope of the Work. Contractor shall proceed with the performance of anychanges in the Work so ordered by the Engineer or City unless the Contractor believes that such Field Order entitles the Contractor to a change in the ContractPrice or Contract Time, or both. In the event Contractor believes the Field Orderrequires a change to the Contract Price or Contract Time, it must provide writtennotice to the Engineer and City within five (5) business days of receipt of the FieldOrder and before starting with any changed Work. Failure to provide such noticewaives Contractor's right to claim such work requires a change in the Contract Price or Contract Time. Once Contractor has provided timely written notice, it shall proceed as directed by City in writing, and thereafter shall file a claim in accordance with the procedures required herein.

14.0 CHANGES IN CONTRACT PRICE

14.1 The Contract Price may be changed only by a Change Order or Construction Change Directive issued in accordance with the terms of the Contract Documents. If the Change Order or Construction Change Directive provides for an adjustment to the Contract Price, the adjustment shall be based on one of the following methods: mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation; or unit prices stated in the Contract Documents or subsequently agreed upon; or cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or on a time and material basis.

14.2 In the event the Owner elects to proceed with changed work on a time and material basis, the following provisions shall apply:

14.2.1 For all labor, including a foreman in direct charge of the specified operations, the Contractor shall receive a sum equal to the current standard local rate of wages actually paid for every hour that the labor is actually engaged in such changed work, plus the actual cost of social security taxes, unemployment insurance, and workmen's compensation insurance based on the actual wages paid for such labor, to which cost shall be added an amount equal to ten percent (10%) thereof for all overhead and profit (including all general supervision and for furnishing and repairing small tools and ordinary equipment used in doing the changed work).

14.2.2 For all materials used, the Contractor shall receive the actual cost of such materials, including freight charges as shown by original receipted bills, to which cost shall be added an amount equal to ten percent (10%) thereof for all overhead and profit.

14.2.3 For any construction equipment or special equipment including fuel and lubricants therefor, required for the economic performance of the changed work, the Engineer shall allow the Contractor a rental price, to be agreed upon in writing before such work is begun, for every hour that such construction equipment or special equipment is actually operated on the work, which rental price shall include all overhead and profit. Such hourly rental price shall not exceed 1/176 part of the monthly rate stated for such equipment in the latest edition of the "Compilation of Rental Rates for Construction Equipment" by Associated Equipment Distributors.

14.2.4 Subcontractors are subject to the above and the Contractor mark- up for overhead and profit shall not exceed five percent (5%) of the amount due to the Subcontractor.

14.2.5 The Contractor shall keep and present, in such form as the Engineer may prescribe, an itemized accounting of all time and material costs, together with appropriate supporting data.

15.0 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1 Time is of the essence in the performance of the Work under this Agreement. The date of beginning and the time for completion of the Work are essential conditions of the Contract Documents. The required date of commencement of the Work shall be established in the Notice to Proceed to be issued by the City. As noted in the Agreement, Contractor shall commence the Work within ten (10) calendar days after the required date of commencement. Any Work performed by Contractor prior to the required date of commencement shall be at the sole risk of Contractor. The Notice to Proceed shall be issued within thirty (30) days of the execution of the Agreement by the City. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement of the City and Contractor. If the Notice to Proceed has not been issued within the thirty (30) day period or within the period mutually agreed upon, the Contractor may terminate the Agreement without further liability on the part of either party by providing the City written notice of such termination, in which event such termination shall be deemed a termination for convenience of the City as set forth in Section 17.5 below. Provided, however, notwithstanding anything in the Contract Documents to the contrary, in the event of such termination pursuant to this Section 15.1, Contractor acknowledges and agrees that no payments will be due Contractor, nor shall the City make any payments to Contractor for any Work that would have been authorized under the Agreement once executed by both parties.

15.2 The Contractor will proceed with the Work at such rate of progress to ensure Substantial Completion within the Contract Time. It is expressly understood

and agreed, by and between the Contractor and the City, that the Contract Time for Substantial Completion of the Work is a reasonable period of time. The Construction Schedule shall include the date the Work must be substantially completed by Contractor and all interim milestones required by the City. Substantial Completion of the Work shall be achieved when the Work has been completed to the point where the City can occupy or utilize the Work for its intended purpose. The Engineer shall certify the date Substantial Completion of the Work is achieved. If the City has designated portions of the Work to be turned over to the City prior to Substantial Completion of the entire Work as provided in Section 15.3 below, the Engineer shall certify the date as to when Substantial Completion of such designated portions of the Work have been achieved. The entire Work shall be fully completed and ready for final acceptance by the City within 30 calendar days after Substantial Completion of the Work or thirty (30) days after Contractor's receipt of the punch list, whichever date occurs last.

1521 Once the Contractor believes it has achieved Substantial Completion of the Work, it shall notify the City and Engineer in writing and request a substantial completion inspection. Concurrent with its delivery of such written notice, Contractor shall submit its initial punch list for the City's and Engineer's review. Any Work remaining to be completed or any defective work to be remedied shall be listed on the punch list. Once the substantial completion inspection has been made, Owner and Engineer shall modify the Contractor's initial punch list to include all items to be completed or repaired by Contractor in order to achieve final acceptance of the Work. Thereafter, the Engineer shall provide Contractor a copy of the final punch list. Such final punch list shall be in compliance with the Contract Documents and all applicable laws, including Section 218.735 of the Florida Statutes. Accordingly, if the Contract Price is less than $10 million, Engineer shall provide the final punch list to Contractor within 30 calendar days after Contractor has achieved Substantial Completion. If the Contract Price is $10 million or more, Engineer shall provide the final punch list to Contractor within 60 calendar days after Contractor has achieved Substantial Completion. Contractor acknowledges and agrees that the failure to include any corrective work or pending items not yet completed on the punch list does not alter the responsibility of Contractor to complete all the Work required under this Contract.

15.3 The City may take early occupancy of all or any portions of the Work, at the City's election, by designating in writing to Contractor the specific portions of the Work to be occupied and the date such occupancy shall commence. If any such specific early occupancy was not expressly identified in the bidding documents issued with respect to this Agreement (as they may have been modified by any applicable Addenda) and such early occupancy adversely impacts Contractor's cost or time of performance, Contractor shall be entitled to an equitable adjustment to the Contract Price and the Contract Time, all in accordance with the other terms and conditions of the Contract Documents.

15.4 The City and Contractor recognize that, since time is of the essence for this Agreement, the City will suffer financial loss if the Work is not substantially completed within the Contract Time, as said time may be adjusted as provided for herein. In such event, the total amount of the City's damages, will be difficult, if not impossible, to definitely ascertain and quantify, because this is a public construction project that will, when completed, benefit the public. It is hereby agreed that it is appropriate and fair that the City receive liquidated damages from Contractor if Contractor fails to achieve Substantial Completion of the Work within the required Contract Time. Should Contractor fail to substantially complete the Work within the Contract Time, the City shall be entitled to assess, as liquidated damages, but not as a penalty, the amount for liquidated damages as specified in the Agreement for each calendar day thereafter until Substantial Completion is achieved. Contractor hereby expressly waives and relinquishes any right which it may have to seek to characterize the above noted liquidated damages as a penalty, which the parties agree represents a fair and reasonable estimate of the City's actual damages at the time of contracting if Contractor fails to achieve Substantial Completion of the Work within the Contract Time.

15.4.1 In the event the Work is not fully completed within 30 days from the date of Substantial Completion, the City reserves the right to assess against Contractor its actual damages incurred as a result of such delay by Contractor.

16.0 CORRECTION OF DEFECTIVE WORK

16.1 Work not conforming to the requirements of the Contract Documents shall be deemed defective Work. If required by the City or Engineer, the Contractor shall as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the defective Work has been rejected by the City or Engineer, remove it from the site and replace it with non-defective Work in accordance with the Contract Documents and without additional expense to the City. Further, Contractor shall bear the expense of making good all work of other contractors performing work on the Project destroyed or damaged by such removal or replacement. Contractor shall bear all direct, indirect and consequential costs of such correction or removal (including, but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby, and shall hold the City and Engineer harmless for same. Notwithstanding anything herein to the contrary, the City may determine, at its sole discretion, to accept defective Work. If such determination is rendered prior to final payment, a Change Order or Construction Change Directive shall be executed evidencing such acceptance of such defective Work, incorporating the necessary revisions in the Contract Documents and reflecting an appropriate decrease in the Contract Price. If the City accepts such defective Work after final

payment, contractor shall promptly pay the City an appropriate amount determined by the City to adequately compensate the City for its acceptance of the defective Work.

16.2 If the Contractor does not take action to correct defective Work or to remove and replace rejected defective Work or if Contractor fails to comply with any of the provisions of the Contract Documents within ten (10) days after receipt of written notice from the City or Engineer, the City may correct and remedy any such deficiency at the expense of the Contractor. To the extent necessary to complete corrective and remedial action, the City may exclude Contractor from any or all of the Project site, take possession of all or any part of the Work, and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Project site and incorporate in the Work all materials and equipment stored at the Project site or for which the City has paid Contractor but which are stored elsewhere. Contractor shall allow the City, Engineer and their respective representatives, agents, and employees such access to the Project site as may be necessary to enable the City to exercise the rights and remedies under this Section. All direct, indirect and consequential costs of the City in exercising such rights and remedies shallbe at Contractor's expense, and a Change Order or a Construction Change Directive shall be issued, incorporating the necessary revisions to the Contract Documents, including an appropriate decrease to the Contract Price. Such direct, indirect and consequential costs shall include, but not be limited to, fees and charges of engineers, architects, attorneys and other professionals, and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of Contractor's defective Work. Contractor shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by the City of the City's rights and remedies hereunder.

17.0 SUSPENSION OF WORK, TERMINATION, AND DELAY

17.1 The City shall have the right to suspend the Work or any portion thereof for a period of not more than ninety (90) days or such additional time as agreed upon by the Contractor, upon giving Contractor written notice of such suspension to the Contractor. The City or Engineer shall fix the date on which Work shall be resumed. The Contractor will resume that Work on the date so fixed unless otherwise directed by the City. Provided Contractor strictly complies with the Change Order and Claims procedures set forth in the Contract Documents, Contractor will be entitled to a Change Order adjusting the Contract Price and Contract Time, as provided in the Contract Documents, to the extent attributable to any such suspension, unless said suspension is due to the fault or neglect of Contractor or anyone for whom Contractor is responsible.

17.2 If, through no act or fault of the Contractor, the Work is suspended for a period

of more than ninety (90) days by the City or under an order of court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) days after it is submitted, or the City fails to pay the Contractor any undisputed amounts within thirty (30) days of its approval, then the Contractor may after ten (10) days from delivery of a written notice to the City and the Engineer and the City's failure to cure such default (or a maximum of sixty (60) days in the event the default cannot reasonably be cured within ten (10) days provided that the City commences to cure within ten (10) days and thereafter diligently and continuously pursues said cure) terminate the Agreement and recover from the City payment for all Work properly executed and reasonable termination expenses sustained. In addition, and in lieu of terminating the Agreement, if the Engineer has failed to act on a request for payment or if the City has failed to make any payment within the aforesaid thirty (30) day periods, the Contractor may upon ten (10) days written notice to the City and the Engineer stop the Work until paid all amounts then due, in which event and upon resumption of the Work, a Change Order shall be issued adjusting the Contract Price and Contract Time as provided in the Contract Documents.

17.3 Contractor shall be considered in material default of the Agreement and such default shall be considered cause for the City to terminate the Contractor's right to continue to perform under the Agreement, in whole or in part, as further set forth in this Section, if Contractor: (1) fails to begin the Work under the Contract Documents within the time specified herein; or (2) fails to properly and timely perform the Work as directed by the City or Engineer or as provided for in the approved Construction Schedule; or (3) performs the Work unsuitably or neglects or refuses to remove materials or to correct or replace such Work as may be rejected as unacceptable or unsuitable; or (4) discontinues the prosecution of the Work contrary to the requirements of the Agreement; or (5) fails to resume Work which has been suspended within a reasonable time after being notified to do so; or (6) becomes insolvent or is declared bankrupt, or commits any act of bankruptcy; or (7) allows any final judgment to stand against it unsatisfied for more than ten (10) days; or (8) makes an assignment for the benefit of creditors; or (9) fails to comply with any applicable codes, laws, ordinances, rules or regulations with respect to the Work; or (10) fails to supply sufficient skilled workmen or suitable materials or equipment; or (11) fails to promptly pay its Subcontractors and Suppliers; or (12) disregards the authority of the City or Engineer; or (12) materially breaches any other provision of the Contract Documents. In rendering its decision as to whether one of the causes under Section 17.3 exist which would permit the City to terminate the Agreement, the City shall be entitled to rely upon the determination of the Engineer concerning such matter.

17.3.1 In such event, and after giving the Contractor and its surety a minimum of ten (10) days from delivery of a written notice to cure any such default (or a maximum of sixty (60) days in the event the default cannotreasonably be cured within ten (10) days provided that Contractor commences

to cure within ten (10) days and thereafter diligently and continuously pursues said cure), the City may at its option, and without releasing or waiving its rights and remedies against Contractor's sureties and without prejudice to any other right or remedy, terminate Contractor's right to proceed under the Agreement in whole or in part, and take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, take assignments of any of Contractor's subcontracts and purchase orders that the City may designate, and finish the Work by whatever method the City in its sole discretion may deem expedient.

17.3.2 If Contractor's right to proceed under the Agreement is terminated, Contractor shall not be entitled to receive any further payment until the Work is finished. All monies expended and all of the costs, losses, damages and extra expenses, including all management, administrative and other overhead and other direct and indirect expenses (including Engineer and attorneys' fees) or damages incurred by the City incident to such completion (collectively "Completion Costs"), shall be deducted from the unpaid balance of the Contract Price. Upon the City's completion, if the unpaid balance of the Contract Price exceeds the Completion Costs, such excess shall be paid to the Contractor. If the Completion Costs exceed the unpaid balance of the Contract Price, Contractor shall pay promptly to the City on demand the full amount of such excess and interest thereon at a rate of 6% per annum until paid.

17.3.3 The liability of Contractor hereunder for Completion Costs shall extend to and include the full amount of any and all sums paid, expenses and losses incurred, damages sustained, and obligations assumed by the City in good faith under the belief that such payments or assumptions were necessary or required, in completing the Work and providing labor, materials, equipment, supplies, and other items therefor or re-letting the Work, and in settlement, discharge or compromise of any claims, demands, suits, and judgments pertaining to or arising out of the Work hereunder. Further, in the event the City has exercised its right to terminate due to Contractor's default, Contractor shall be prohibited from bidding or otherwise seeking additional work from the City in accordance with the City's then current debarment policy.

17.3.4 The City may deduct from any payment, any sum owed by the City to Contractor, either under this Agreement or any other agreement between the City and the Contractor. Further, a default by Contractor under any other agreement with the City shall be deemed a default under this Agreement and a default under this Agreement shall be deemed a default under any other agreement between the City and Contractor.

17.4 Where the Contractor's services have been so terminated by the City, said termination shall not affect any right of the City against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies by the City due the Contractor will not release the Contractor from compliance with the Contract Documents. Further, if after notice of termination of

Contractor's right to proceed pursuant to Section 17.3, it is determined for any

reason that Contractor was not in default, or that its default was excusable, or that the City is not entitled to the remedies against Contractor provided herein, then such termination shall be deemed a termination for the City's convenience and Contractor's remedies against the City shall be the same as and limited to those afforded Contractor under Section 17.5 below.

17.5 The City shall have the right to terminate this Agreement without cause upon ten (10) days from delivery of a written notice to the Contractor. In the event of such termination for convenience, Contractor's sole and exclusive recovery against the City shall be limited to that portion of the Contract Price earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred, but Contractor shall not be entitled to any other or further recovery against the City, including, but not limited to, damages or any anticipated profit on portions of the Work not performed.

18.0 PAYMENT TO CONTRACTOR

18.1 At least ten (10) days before submitting the first Application for Payment, the Contractor shall submit to the City and Engineer a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the City or Engineer may require. It is anticipated the schedule of values substantially will be based upon the Contractor's completed Bid Proposal Form, attached as Section 00030. This schedule, unless objected to by the City or Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment. On or before the 25th of each month, the Contractor will submit to the Engineer an Application forPayment filled out and signed by the Contractor covering the Work performed since the previous month's Application for Payment. The Application for Paymentmay also include the cost of such materials and equipment which are suitably stored either at or off the site to the extent such payment is approved by City asprovided in Section 18.1.1 below. Invoices received after the 25th day of each month shall be considered for payment as part of the next month's Application for Payment. Contractor's Application for Payment shall be in such form and contain such detail and backup as the City reasonably may require.

18.1.1 If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at or off the site, the Application for Payment shall also be accompanied by such supporting data, satisfactory to the City, as will establish the City's title tothe material and equipment free and clear of all liens, charges, security interests and encumbrances, together with evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect City's interest therein, all of which shall be subject to City's satisfaction. City has the discretion whether or not to pay for such unincorporated materials.

18.1.2 The Engineer will, within ten (10) days after receipt of each Application for

Payment, indicate in writing its recommendation as to that portion of the payment being requested by Contractor in the Application for Payment which Engineer believes is due and payable. The City shall pay Contractor that portion of the Application for Payment approved by Engineer and Owner within fifteen (15) days of the City's receipt of the Engineer's payment recommendation.

18.1.3 City shall retain an amount equal to 5% of the approved amount to be paid Contractor under each monthly Application for Payment. The retainage shall be accumulated and not released to Contractor until final payment is due. Provided, however, the City reserves the right, in its sole discretion, to reduce such retainage prior to final payment; but at no time shall the retainage be reduced to less than five percent (5%) prior to Contractor achieving Substantial Completion. Provided, further however, if at any time during this Agreement, and in the City's sole discretion, the City becomes dissatisfied with Contractor's performance or if Contractor is in default, the City shall have the right to reinstate the full amount ofretainage at five percent (5%).

18.1.4 Monthly payments to Contractor shall in no way imply approval or acceptance of the Work.

18.1.5 Each Application for Payment shall be accompanied by a claim release and waiver in the form set forth in the City's Project Administration Manual from Contractor for all materials, labor, equipment, services and other bills associated with that portion of the Work payment is being requested in that Application for Payment . Further, each Application for Payment shall be accompanied by a claim release and waiver in the form set forth in the City's Project Administration Manual from all Subcontractors and Suppliers evidencing their payment in full through the previous month's Application for Payment. Also, each Application for Payment shall be accompanied by an updated Construction Schedule, a list inventorying all stored materials, a monthly progress status report, and any other document reasonably requested by City. The City shall not be required to make payment until and unless such releases, documents and information are furnished by Contractor. Further, if Contractor is withholding any portion of a payment to any Subcontractor or Supplier for any labor, services, or materials for which the City has paid Contractor, Contractor agrees to refund such money to the City upon demand by the City.

18.1.6 Engineer shall review each Application for Payment submitted by Contractor and shall make recommendations to the City as to the proper amounts, if any, which may be owed Contractor thereunder. Both Engineer and the City shall have the right to refuse to approve payment amounts, or portions thereof, requested by Contractor in an Application for Payment, or rescind any amount previously approved, and the City may withhold any payments otherwise due Contractor under this Agreement or any other

agreement between the City and Contractor, to the extent it is reasonably necessary, to protect the City from any expense, cost or loss attributable to: (a) defective or deficient Work not properly remedied in accordance with the terms of the Contract Documents; (b) the filing or reasonable evidence indicating the probable filing of third party claims against the City attributable to the fault or neglect of Contractor; (c) Contractor's failure to make timely and proper payments to all Subcontractors and Suppliers; (d) reasonable evidence that the remaining Work cannot be completed for the unpaid Contract Price balance; (e) reasonable evidence indicating that the remaining Work cannot be completed within the remaining Contract Time; (f) Contractor's failure to satisfactorily prosecute the Work in accordance with the requirements of the Contract Documents; or (g) any other material breach of the requirements of the Contract Documents by Contractor. The City shall have the right, but not the obligation, to take any corrective action the City deems appropriate to cure any of the above noted items, at Contractor's expense, if such items are not cured by Contractor to the City's reasonable satisfaction within three (3) days after Contractor's receipt of written notice from the City.

18.1.7 Engineer or City may reject an Application for Payment, in whole or in part, submitted by Contractor if such Application for Payment is not submitted in strict accordance with the requirements of this Article 18. In such event, Engineer or City shall notify Contractor in writing within twenty (20) business days after receipt of such Application for Payment that such Application for Payment, or portion thereof, has been rejected and the reasons for such rejection. If Contractor resubmits a corrected Application for Payment correcting, in Engineer's and Owner's sole determination, the deficiency specified in the rejection notice, then City shall pay Contractor the corrected portion of the Application for Payment within ten business days after the date the corrected Application for Payment is received by City.

18.2 Prior to Substantial Completion, the City, with the approval of the Engineer, may use any completed or substantially completed portions of the Work. Such use shall not constitute an acceptance of such portions of the Work.

18.3 The City shall have the right to enter the Project site for the purposes of doing work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the City.

18.4 Upon completion and acceptance of the Work, the Engineer shall issue a certificate attached to the final payment request that states the Work has been fully performed in accordance with the requirements of the Contract Documents and that Engineer recommends final payment in the amount reflected in the attached final payment request. The City shall make final payment to Contractor within thirty (30) days after the Work is finally accepted by the City, provided that Contractor first, and as an explicit condition precedent to the accrual of Contractor's right to final payment, shall have furnished the City with a properly executed and notarized final release in the form set forth in the City's Project Administration Manual, as well as, a duly executed copy of the surety's consent to final payment and such other documentation that may be required by the Contract Documents or the City.

18.5 Late payments shall accrue interest from the date payment was due until payment is received at the rate of six percent (6%) per annum.

18.6 No error or oversight in the making of payment or completion certificates shall relieve the Contractor from its obligation to do and complete the Work in accordance with the requirements of the Contract Documents.

19.0 ACCEPTANCE OF FINAL PAYMENT AS RELEASE

19.1 The acceptance by the Contractor of final payment shall be and shall operate as a full release and waiver of any and all claims by Contractor against the City arising out of this Agreement or otherwise relating to the Project, except those identified in writing by Contractor as unsettled in its final Application for Payment. Any payment, however, final or otherwise shall not release the Contractor or its sureties from any obligations under the Contract Documents or the Performance and Payment Bonds. Neither the acceptance of the Work nor payment by the City shall be deemed to be a waiver of the City's right to enforce any obligations of Contractor hereunder or to the recovery of damages for defective Work not discovered by the City or Engineer at the time of final inspection.

20.0 CONTRACT SECURITY

20.1 The Contractor shall within ten (10) days after the receipt of the Notice of Award and prior to the start of any Work furnish the City with a Performance Bond and a Payment Bond in penal sums equal to 100% of the amount of the Contract Price and in the forms attached as Sections 00060 and 00070. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the State of Florida and named on the current lists of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570 and approved by the City. The expense of these Bonds shall be borne by the Contractor. If at any time a

surety on any such Bond is declared as bankrupt or loses its rights to do business in Florida or is removed from the list of Surety Companies accepted on Federal Bonds, Contractor shall within ten (10) days after notice from the City to do so, substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the City. The premiums on such replacement Bond shall be paid by the Contractor. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the City.

20.2 The Contractor and its Surety, for value received, hereby stipulate and agree that any and all claims, demands, actions or suits whatsoever, arising under this Agreement and/or bonds, shall be subject to the sole and exclusive jurisdiction and venue of the appropriate state court in and for Bay County, Florida. The Contractor and its Surety do agree, by execution of these documents, that the sole and exclusive jurisdiction and venue in said forum is proper and appropriate since performance of the underlying contract for which these documents are executed is to be accomplished within Bay County, Florida.

21.0 ASSIGNMENTS

21.1 Contractor shall not assign this Agreement or any part thereof, without the prior consent in writing of the City, which consent shall be at City's' sole discretion. If Contractor does, with City's written approval, assign this Agreement or any part thereof, Contractor shall not be released from any of its obligations or responsibilities under this Agreement.

22.0 INDEMNIFICATION AND HOLD HARMLESS

22.1 To the maximum extent permitted by Florida law, Contractor shall indemnify and hold harmless the City and its officers and employees from any and all liabilities, claims, damages, penalties, demands, judgments, actions, proceedings, losses or costs, including, but not limited to, reasonable attorneys' fees and paralegals' fees, whether resulting from any claimed breach of this Agreement by Contractor or from personal injury, property damage, direct or consequential damages, or economic loss, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor or anyone employed or utilized by the Contractor in the performance of this Agreement.

22.2 Contractor's obligation to indemnify and hold harmless under this Article 22 will survive the expiration or earlier termination of this Agreement until it is determined by final judgment that an action against the City or an indemnified party for the matter indemnified hereunder is fully and finally barred by the applicable statute of limitations.

22.3 The obligation of the Contractor under this Article 22 shall not extend to the

liability of the Engineer, its agents or employees arising out of the preparation of approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications.

23.0 SEPARATE CONTRACTS AND COOPERATION

23.1 The City reserves the right to perform other work related to the Project at the site by the City's own forces, have other work performed by utility owners or let other direct contracts for work to be constructed at the same time, and in connection with, the Work included in this Agreement. The Contractor shall cooperate with all other contractors in such a manner, and to such extent, as best to facilitate the completion of the entire Project in the shortest time possible, subject to, at all times, the approval of the Engineer and Owner. It shall be the duty of each contractor to work with the other contractors, render such assistance, and to arrange its work in such a manner that shall allow the entire Project to be delivered complete and in the best possible condition. The Contractor shall afford other contractors and utility owners' reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results.

23.2 If the performance of additional work by other contractors, utility owners, or the City is not noted in the Contract Documents prior to the execution of the Agreement, written notice thereof shall be given to the Contractor prior to starting any such additional work. If the Contractor believes that the performance of such undisclosed additional work by the City or others involves it in additional expense or entitles it to an extension of the Contract Time, the Contractor shall send written notice of that fact to the City and Engineer within seven (7) calendar days of being notified of the other work and the Contractor may make a claim thereof as provided in Sections 13 and 14. If Contractor fails to send the above required seven (7) calendar days' notice, Contractor will be deemed to have waived any rights it otherwise may have had to seek an extension to the Contract Time or adjustment to the Contract Price.

23.3 Contractor shall afford each utility owner and City's other contractors (or the City if the City is performing the additional work with the City's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work and shall properly connect and coordinate its Work with theirs. Contractor shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. Contractor shall be responsible for all damage to the work of others caused by the performance of its

Work. Further, Contractor shall not in any way cut or alter the

work of others without first receiving the written consent of that other person and Engineer. If any part of Contractor's Work depends for proper execution or results upon the work of any other contractor or utility owner (or the City), Contractor shall inspect and promptly report to Engineer in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. Such report must be made within three (3) business days of the time Contractor first became aware of the delay, defect or deficiency. Contractor's failure to report within the allotted time will constitute an acceptance of the other work as fit and proper for integration with Contractor's Work, except for latent defects not discovered by Contractor.

23.4 The Contractor shall keep itself fully informed at all times regarding all details of the work of other contractors working at the site, and it shall be responsible for all delays that may result from its failure to install the Work in the proper manner and at the proper time.

23.5 The Contractor shall be responsible for coordinating the relocation of existing utilities (with the respective utility companies) as needed to construct the Project. Attention is called to the fact that Contractor is responsible for contacting all utility companies to obtain locations of all existing utilities or obstructions which it may encounter during construction. After location of utilities by the appropriate utility company, it is the Contractor's liability to protect all such utility lines, including service lines and appurtenances, and to replace at its own expense any which may be damaged by the Contractor's equipment or forces during construction of the Project. The City will pay fees charged by the utility company for relocating these utilities.

24.0 SUBCONTRACTING

24.1 Contractor shall review the design and shall determine how it desires to divide the sequence of construction activities. Contractor will determine the breakdown and composition of bid packages for award of subcontracts, based on the current Construction Schedule, and shall supply a copy of that breakdown and composition to the City and Engineer for their review and approval. The Contractor may utilize the services of specialty Subcontractors on those parts of the Work which, under normal contracting practices, are performed by specialty Subcontractors. Contractor shall be solely responsible for and have control over the Subcontractors.

24.2 Prior to submitting its first Application for Payment, Contractor shall submit to the City a list of the names, addresses, licensing information and phone numbers of the Subcontractors Contractor intends to use for each portion of the Work, as well as identifying in writing those portions of the Work it intends to perform with its own employees. The Contractor shall not use a Subcontractor or Supplier against whom the Owner has a reasonable objection. The list identifying each

Subcontractor cannot be modified, changed, or amended without prior written approval from the City. Contractor shall continuously update that list, so that it remains current and accurate throughout the entire performance of the Work. Any and all work to be self-performed by Contractor must be approved in writing by the City in its sole discretion prior to commencement of such Work. The Contractor shall not award work to Subcontractor(s) in excess of fifty percent (50%) of the Contract Price, without prior written approval of the City.

24.3 The Contractor shall be fully responsible for and have control over the acts and omissions of its Subcontractors, and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by it.

24.4 The Contractor shall cause appropriate provisions to be inserted in all Subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the work of Subcontractors and give the Contractor the same power to terminate any subcontract that the City may exercise over the Contractor under any provision of the Contract Documents. Further, each subcontract shall require that any claims by a Subcontractor for delay or additional cost must be submitted to Contractor within the time and in the manner in which Contractor must submit such claims to the City, and that failure to comply with such conditions for giving notice and submitting claims shall result in the waiver of such claims.

24.5 All subcontracts between Contractor and its Subcontractors shall be in writing and are subject to the City's approval. Further, all subcontracts shall (1) require each Subcontractor to be bound to Contractor to the same extent Contractor is bound to the City by the terms of the Contract Documents, as those terms may apply to the portion of the Work to be performed by the Subcontractor, (2) provide for the assignment of the subcontracts from Contractor to the City at the election of the City upon termination of Contractor, (3) provide that the City will be an additional indemnified party of the subcontract, (4) provide that the City will be an additional insured on all insurance policies required to be provided by the Subcontractor except workman's' compensation, (5) assign all warranties directly to the City, and (6) identify the City as an intended third-party beneficiary of the subcontract.

24.6 Nothing contained in this Agreement shall create any contractual relation between any Subcontractor or Supplier and the City. All subcontracts and purchase orders entered into by Contractor must be in writing, and upon demand from City, Contractor shall deliver to City a full and complete copy of any or all such subcontracts and purchase orders.

24.7 Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract, copies of the Contract Documents to which the Subcontractor will be bound. Each Subcontractor shall similarly make copies of such documents available to its sub-subcontractors.

24.8 The Contractor shall not use a Subcontractor or Supplier against whom the City has a reasonable objection and Contractor shall not be required to contract with anyone it reasonably objects to.

24.8 The City and Engineer are under no duty or obligation whatsoever to any Subcontractor, Supplier, laborer or other party to ensure that payments due and owing by the Contractor to any of them will be made. Such parties shall rely only on the Contractor's surety bonds for remedy of nonpayment by the Contractor.

25.0 ENGINEER'S AUTHORITY

25.1 The Engineer shall act as the City's representative during the construction period, shall decide questions which may arise as to quality and acceptability of materials furnished and Work performed, and shall interpret the intent of the Contract Documents in a fair and reasonable manner. The Engineer will make visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.

25.2 The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of materials, workmanship, and execution of the Work. Inspections may be at the factory or fabrication plant of the source of material supply.

25.3 The Engineer and the City will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

25.4 The Engineer shall promptly make decisions relative to interpretation of the Contract Documents.

26.0 LAND AND RIGHT-OF-WAYS

26.1 Prior to the issuance of the NOTICE TO PROCEED, the City shall obtain all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise noted in the Contract Documents.

26.2 The City shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

26.3 The Contractor shall provide at its own expense and without liability to the City any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

27.0 GUARANTEE

27.1 The Contractor warrants to the City and Engineer those materials and equipment furnished under the Agreement will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Contractor further warrants to the City that all materials and equipment furnished under the Contract Documents shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturers, fabricators, suppliers or processors except as otherwise provided for in the Contract Documents. Further, any special warranty to be provided will be in such form as is acceptable to the City and shall not include any exclusions, exceptions or modifications except to the extent approved by the City in its sole discretion. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear from normal usage. If required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

27.2 Contractor expressly warrants to the City that it shall promptly correct, upon receipt of written notice from the City, any portion of the Work which is found to be defective or otherwise not in conformance with the requirements of the Contract Documents. The City will give notice of observed defects with reasonable promptness. Provided, however, in the event that any defective or non-conforming Work is determined by the City in its sole discretion to present an immediate threat to safety or security, the City shall be entitled to correct or replace such defective or non-conforming portions of the Work, and Contractor shall reimburse the City for all costs and expenses incurred by the City in correcting or replacing such Work. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the City may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period. With respect to the correction or replacement of any defective or nonconforming Work, Contractor shall be liable for all damage to any part of the Work itself and to any adjacent property which is caused by such corrective or replacement work.

27.3 If, within one year after the date of final acceptance of the Work by the City, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the City to do so unless the City has previously given the Contractor an express written acceptance of such condition. The City shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work

within a reasonable period of time (not to exceed 10 days) after receipt of notice from the City or Engineer, the Owner may correct or replace it in accordance with Section 27.2 above. This one-year correction period is in addition to all other rights and does not limit the time period the City can seek to have the defective Work corrected.

27.4 Contractor shall obtain and assign to the City all express warranties given to Contractor by any Subcontractors or by Suppliers.

28.0 CLAIMS AND DISPUTES

28.1 The term “Claim” as used herein shall mean any and all demands made by one party hereunder against the other party, whether such demand be for money, time or the assertion of any right or obligation that arises out of the Contract Documents.

28.2 Initial notice of Claims by Contractor shall be made in writing to the City and Engineer within seven (7) calendar days after the first day of the event giving rise to such Claim or such other time period as may be expressly provided in the Contract Documents. If Contractor fails to give such written notice within the required time period, Contractor shall be deemed to have waived the Claim. Written data supporting Contractor’s claim shall be submitted to the City and Engineer within thirty (30) calendar days after the occurrence of the event, or such other time period as may be expressly provided in the Contract Documents, unless the City grants additional time in writing, or else Contractor shall be deemed to have waived the Claim.

28.3 Contractor shall proceed diligently with its performance as directed by the City, regardless of any pending Claim, unless otherwise agreed to by the City in writing. The City shall continue to make payments of all undisputed amounts in accordance with the Contract Documents during the pendency of any Claim.

28.4 Prior to the initiation of any action or proceeding permitted by this Agreement to resolve disputes between the parties, the parties shall make a good faith effort to resolve any such disputes by negotiation between the President or Vice- President for the Contractor and the City Manager Failing resolution, and prior to the commencement of depositions in any litigation between the parties with respect to the Project, the parties shall attempt to resolve the dispute through mediation before an agreed-upon Circuit Court Mediator certified by the State of Florida. Should either party fail to submit to mediation as required hereunder, the other party may request a court of law to order mediation under Florida Statutes Section 44.102.

28.5 Any litigation between the City and Contractor (which term for the purposes of this Section shall include Contractor’s surety), whether arising out of any Claim or arising out of the Agreement or any breach thereof, shall be brought, maintained and pursued solely and exclusively in the appropriate State courts of the State of

Florida as set forth in Section 20.2. The City and Contractor each hereby waive and renounce any and all rights and options which they, or either of them, have or might have to bring or maintain any such litigation or action in the Federal Court system of the United States or in any United States Federal District Court. Venue of any such litigation between the City and Contractor shall lie and be only in the appropriate State courts in and for Bay County, Florida. Contractor consents and submits to the exclusive jurisdiction of any such court and agrees to accept service of process from the State of Florida in any matter to be submitted to any such court.

29.0 TAXES

29.1 The Contractor will pay all applicable sales, consumer, use and other similar taxes required by the laws of the place where the Work is performed.

30.0 CONTRACT TIME, SCHEDULE OF WORK AND TIME EXTENSIONS

30.1 Contractor shall diligently pursue the completion of the Work and coordinate the Work being done on the Project by its Subcontractors and Suppliers, as well as coordinating its Work with all work of others at the Project site, so that its Work or the work of others shall not be delayed or impaired by any act or omission by Contractor or anyone for whom Contractor is liable. All Work under this Agreement shall be arranged and be carried out in such a manner as to complete the Work on or before the required date of Substantial Completion. The Contractor must notify the City at the time of bidding if the chronology of the Work as shown, or the subdivision of work will affect warranties or guarantees in any way. No such claims shall be allowed once the Work has begun.

30.2 Should Contractor be obstructed or delayed in the prosecution of or completion of the Work as a result of unforeseeable causes beyond the control of Contractor, and not due to its fault or neglect, including but not restricted to acts of God or of the public enemy, acts of government, fires, floods, epidemics, quarantine regulation, strikes, lockouts, unusually severe weather conditions by comparison with the ten-year Bay County, Florida average not reasonably anticipatable (to the extent Contractor was unable to perform any portion of the Work that was on the critical path of the approved Construction Schedule during those inclement weather days), Contractor shall notify Owner and Engineer in writing within seven (7) calendar days after the commencement of such delay, stating the cause or causes thereof, or be deemed to have waived any right which Contractor may have had to request a time extension.

30.3 The Contractor is required to furnish adequate manpower at the Project to complete the Work within the Contract Time and in accordance with the Construction Schedule. Should payment of premium time, bonuses, or the like be

necessary to attract sufficient manpower for the Project, such extra labor costs shall be borne by the Contractor without additional compensation from the City. Further, should the Contractor's Work, through no fault of the Engineer, the City, or City's other contractors, fail to progress in accordance with the Construction Schedule, and if, in the opinion of the Engineer, the Work cannot be substantially completed within the Contract Time, or if deemed necessary to protect this or adjoining work from damage, the Contractor shall work such additional time over the established hours of work, but excluding Holidays, as required to meet the schedule time without additional expense to the City. In such event, Contractor shall reimburse City for any additional costs incurred by the City associated with such overtime, including any additional costs of the Engineer.

30.4 When so ordered in writing by the Engineer or City, whether to advance the date of Substantial Completion, or for any other reason for the City's benefit, the Contractor shall work overtime and or additional shifts. If the order for such acceleration is not the result of Contractor being behind the approved Construction Schedule, Contractor shall be entitled to a Change Order increasing the Contract Price by its actual net premium costs of such overtime and or shifts so ordered and so worked, including insurance and taxes applicable thereto, (without other overhead or profit). Such costs and expenses shall be subject to audit by the City.

30.5 When any period of time is referenced by days herein, it shall be computed to exclude the first day and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day recognized by the City as a legal holiday, such day shall be omitted from the computation, and the last day shall become the next succeeding day which is not a Saturday, Sunday or legal holiday. The term "business day" as used herein shall mean all days of the week excluding Saturdays, Sundays and all legal holidays observed by the City.

31.0 USE OF SITE

31.1 The Contractor shall confine its use of the site for storage of materials, erection of temporary facilities and parking of vehicles to areas within its Agreement limits as directed by the Engineer. The Contractor shall not unnecessarily encumber the site at any time.

31.2 Contractor acknowledges that areas of the site in which Work under this Agreement may be performed may be used by other contractors for storage of materials, erection of temporary facilities and parking of vehicles. Areas used by other contractors will be vacated, as directed by the Engineer to permit Work under this Agreement, provided reasonable notice is given requesting such, all in accordance with the approved Construction Schedule.

31.3 No signs or advertisements shall be displayed on the site or building except with the written consent of the City.

32.0 TEMPORARY FACILITIES

32.1 The Contractor shall provide electric power and water as it may require for its construction purposes and shall pay all costs incurred. At completion of the Work, all temporary facilities shall be removed from the site. Upon Substantial Completion of the Work, Contractor shall cause all permanent utilities to be utilized by the City that were in Contractor's name during construction of the Project to be transferred over to the City's name.

32.2 The Contractor shall provide sanitary facilities for its workmen at all times. Sanitary facilities shall be of an approved chemical type with regular servicing and appropriately screened from public view, as approved by the Engineer and all applicable health authorities.

33.0 CLEAN UP AND DISPOSAL OF WASTE MATERIALS AND HAZARDOUS MATERIALS

33.1 No burial of waste materials will be permitted on the site. The Contractor shall at all times keep the site free from accumulations of waste material or debris caused by its operations and shall immediately remove same when necessary or required by the Engineer or the City. If Contractor fails to keep the Project site clean, the City has the right, after providing a twenty-four (24) hour written notice, to perform any required clean up and to backcharge Contractor for the costs of such clean up. At the completion of the Work, and before final inspection and acceptance of the Work, Contractor shall clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, regrassing if necessary, to as good condition as existed before Work started, and remove all debris, rubbish and waste materials from and about the Project site, as well as all of Contractor's (and its Subcontractors') tools, appliances, construction equipment and machinery and surface materials, and shall leave the Project site clean and ready for occupancy by the City. Any existing surface or subsurface improvements, including, but not limited to, pavements, curbs, sidewalks, pipes, utilities, footings, structures, trees and shrubbery, not indicated in the Contract Documents to be removed or altered, shall be protected by Contractor from damage during the prosecution of the Work. Any such improvements so damaged shall be restored by Contractor to condition at least equal to that existing at the time of Contractor's commencement of the Work

33.2 If Contractor encounters on the Project site any materials reasonably believed by Contractor to be petroleum or petroleum related products or other hazardous or toxic substances which have not been rendered harmless, Contractor immediately shall (i) stop Work in the area affected and (ii) report the condition to the City in writing. If the Work is so stopped and hazardous material is found, the Work in the affected area shall not thereafter be resumed except by Change Order. Any such

Change Order shall include, but not be limited to, an equitable adjustment to the Contract Time and Contract Price as appropriate and in accordance with the terms of the Contract Documents. If no hazardous material is found after the Work is stopped, no Change Order is required to resume the Work in the affected area. Further, if the hazardous material was generated or caused by Contractor or anyone for whom Contractor is responsible, or if Contractor failed to stop Work or give the written notice required above, no Change Order will be required for an adjustment in the Contract Time or Contract Price and Contractor shall indemnify the City and hold the City harmless for any costs incurred by the City with respect to such hazardous material generated or caused by Contractor or anyone for whom it is responsible or any increased costs incurred by City as a result of Contractor's failure to stop Work or give the required written notice.

34.0 WARRANTY OF TITLE

34.1 No material supplies or equipment for the Work shall be purchased by the Contractor subject to any chattel mortgage or under a conditional sale or other agreement by which a lien or an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants good title to all materials, supplies and equipment installed or incorporated in the Work and title to all such items shall pass to the City upon its incorporation into the Work or payment, whichever occurs first. Contractor shall, at all times, keep the site, together with all improvements and appurtenances constructed or placed thereon by it, free from any claims, liens or charges and further agrees that neither Contractor nor any person, firm, or corporation furnishing any material or labor for any Work covered by this Agreement shall have any right to a lien upon the Work, site or any improvements or appurtenances thereon. The Contractor shall not at any time suffer or permit any lien, attachment, or other encumbrances under the law of Florida or otherwise by any person or persons whomsoever to remain on file with the City against any money due or to become due for any work done or materials furnished under the Agreement or by reason of any other claim or demand against the Contractor. Such lien, attachment, or other encumbrance, until it is removed, shall preclude any and all claims or demands for any payment to Contractor under virtue of this Agreement.

35.0 OWNERSHIP OF HIDDEN VALUABLE MATERIALS

35.1 All items having any apparent historical or archaeological interest, treasure or valuable materials discovered during any construction activities shall be carefully preserved and reported immediately to the City for determination of appropriate actions to be taken. Any increases to Contractor's time or cost of performance due to historical or archaeological items discovered on the site shall entitle Contractor to a Change Order equitably adjusting the Contract Time and the Contract Price as appropriate and in accordance with the terms of the Contract Documents. Notwithstanding anything in the Contract Documents to the contrary, Contractor shall have no claim or entitlement to any such historical or

archaeological interest or treasure or other valuable materials discovered, and all such items shall remain the property of the City.

36.0 AS-BUILT PLANS and DOCUMENTS TO BE KEPT AT THE SITE

36.1 Before final inspection the Contractor shall turn over to the Engineer a set of drawings showing field changes and actual installed conditions. CONTRACTOR shall provide to the ENGINEER two (2) hard copies and one (1) electronic copy of the as-built plans in AutoCAD 2018. The plans shall be certified by a P.L.S. registered in the State of Florida.

36.2 Contractor shall maintain at the Project site or such other place as may be expressly approved in writing by Owner, originals or copies of, on a current basis, all Project files and records, including, but not limited to, the following administrative records: Subcontracts and Purchase Orders; Subcontractor Licenses; Shop Drawing Submittal/Approval Logs; Equipment Purchase/Delivery Logs; Contract Drawings and Specifications with Addenda; Warranties and Guarantees; Cost Accounting Records; Payment Request Records; Meeting Minutes; Insurance Certificates and Bonds; Contract Changes; Permits; Material Purchase Delivery Logs; Technical Standards; Design Handbooks; “As-Built” Marked Prints; Operating & Maintenance Instruction; Daily Progress Reports; Monthly Progress Reports; Correspondence Files; Transmittal Records; Inspection Reports; Bid/Award Information; Bid Analysis and Negotiations; Punch Lists; and a Construction Schedule (including all updates). The Project files and records shall be available at all times to the City and Engineer or their designees for reference, review or copying.

37.0 SILENCE OF SPECIFICATIONS

37.1 To the extent the Work involves road or bridge construction, the apparent silence of the Contract Documents as to any details or the omission from them of a detailed description concerning any point shall be regarded as meaning that such portion of the Work shall be performed in accordance with the latest edition of the Florida DOT Standard Specifications for Road and Bridge Construction.

38.0 GRATUITIES

38.1 If the City finds after a notice and hearing that the Contractor, or any of the Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts or otherwise) to any official, employee, or agent of the City, the State, or other officials in an attempt to secure this Agreement or favorable treatment in awarding, amending, or making any determinations related to the performance of this Agreement, the City may, by written notice to the Contractor, terminate this Agreement for Contractor default. The City may also pursue other

rights and remedies that the law or this Agreement provides.

38.2 In the event this Agreement is terminated as provided in Section 38.1, the City may pursue the same remedies against the Contractor as it could pursue in the event of a breach of the Agreement by the Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, the City may pursue exemplary damages in an amount (as determined by the City) which shall be not less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such official, agent or employee of the City.

39.0 AUDIT AND ACCESS TO RECORDS

39.1 Contractor shall keep all records and supporting documentation which concern or relate to the Work hereunder for a minimum of three (3) years from the date of termination of this Agreement or the date the Project is completed, whichever is later or such longer period of time as may be required by law. Contractor shall require all of its Subcontractors to likewise retain all of their Project records and supporting documentation. The City, and any duly authorized agents or representatives of the City, shall be provided access to all such records and supporting documentation at any and all times during normal business hours upon request by the City. Contractor shall make all such Project records and supporting documentation available in Bay County, Florida. Further, the City, and any duly authorized agents or representatives of the City, shall have the right to audit, inspect and copy all of Contractor’s and any Subcontractor’s Project records and documentation as often as they deem necessary and Contractor shall cooperate in any audit, inspection, or copying of the documents. These access, inspection, copying and auditing rights shall survive the termination of this Agreement.

40.0 EQUAL OPPORTUNITY REQUIREMENTS

40.1 For all contracts in excess of $10,000, the Contractor shall comply with Executive Order 11246, entitled "Equal Employment Opportunity", as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60).

40.2 The Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographic area where the Agreement is to be performed.

41.0 CHANGED CONDITIONS

41.1 Notwithstanding anything in the Contract Documents to the contrary, if conditions

are encountered at the Project site which are (i) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (ii) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, and which reasonably should not have been discovered by Contractor as part of its scope of site investigative services required pursuant to the terms of the Contract Documents, then Contractor shall provide the City with prompt written notice thereof before conditions are disturbed and in no event later than seven (7) calendar days after first observance of such conditions. the City and Engineer shall promptly investigate such conditions and, if they differ materially and cause an increase or decrease in Contractor's cost of, or time required for, performance of any part of the Work, the City will acknowledge and agree to an equitable adjustment to the Contract Price or Contract Time, or both, for such Work. If the City determines that the conditions at the site are not materially different from those indicated in the Contract Documents or not of an unusual nature or should have been discovered by Contractor as part of its investigative services, and that no change in the terms of the Agreement is justified, the City shall so notify Contractor in writing, stating its reasons. Claims by Contractor in opposition to such determination by the City must be made within seven (7) calendar days after Contractor's receipt of the City's written determination notice. If the City and Contractor cannot agree on an adjustment to the Contract Price or Contract Time, the dispute resolution procedure set forth in the Contract Documents shall be complied with by the parties.

42.0 COMPLIANCE WITH LAWS

42.1 Contractor agrees to comply, at its own expense, with all federal, state and local laws, codes, statutes, ordinances, rules, administrative orders, regulations and requirements applicable to the Project, including but not limited to those dealing with safety (including, but not limited to, the Trench Safety Act, Chapter 553, Florida Statutes). An executed copy of Contractor's Trench Safety Act Certificate of Compliance (the form of which is attached hereto as Section 00096) has been delivered to City with the Contractor's Bid Proposal Form. If Contractor observes that the Contract Documents are at variance therewith, it shall promptly notify the City and Engineer in writing. Contractor has provided a separate line item in its Bid identifying the cost of compliance with the applicable trench safety standards set forth in the Trench Safety Act.

43.0 PUBLIC ENTITY CRIMES

43.1 By its execution of the Agreement and the Contractor's Public Entities Crime Statement, in the form set forth in Section 00097). Contractor acknowledges that it has been informed by the City of and warrants that it is in compliance with the terms of Section 287.133(2)(a) of the Florida Statutes which reads as follows:

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity in excess of the threshold amount provided in s. 287.017 for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

44.0 INSURANCE

44.1 During the term of this Agreement, Contractor shall provide, pay for, and maintain, with companies satisfactory to the City, the types and limits of insurance required by the Contract Documents. All insurance shall be from responsible companies eligible to do business in the State of Florida. Simultaneously with the execution and delivery of this Agreement by Contractor, Contractor shall deliver to the City the properly completed and executed Certificate of Insurance, in the form set forth in Section 00099 along with any other properly completed and executed Certificates of Insurance that may be necessary, evidencing the fact that Contractor has acquired and put in place the insurance coverages and limits required herein. In addition, certified, true and exact copies of all insurance policies required shall be provided to the City, on a timely basis, if requested by the City. These Certificates and policies shall contain provisions that at least thirty (30) calendar days advanced written notice by registered or certified mail shall be given the City of any cancellation, intent not to renew, or any policy change that would result in a reduction in the policies' coverages, except in the application of the Aggregate Limits Provisions. The renewal of any insurance required to be maintained by Contractor hereunder shall be by a renewal Certificate of Insurance in the same form as was required for the original Certificate of Insurance, which renewal Certificate of Insurance shall be delivered to City at least ten (10) calendar days prior to expiration of current coverages so that there shall be no interruption in the Work due to lack of proof of insurance coverages required of Contractor under this Agreement.

44.2 Contractor shall also notify the City, in the same manner required in Section 44.1 above, within two (2) calendar days after Contractor's receipt, of any notices of expiration, cancellation, non-renewal or material change in coverages or limits received by Contractor from its insurer, and nothing contained herein shall relieve Contractor of this requirement to provide notice. In the event of a reduction in the aggregate limit of any policy to be provided by it hereunder, Contractor shall immediately take steps to have the aggregate limit reinstated to the full extent permitted under such policy. If, at any time, City requests a written statement

from an insurance company as to any impairment to any aggregate limit of any policy to be provided by it hereunder, Contractor shall promptly authorize and cause to be delivered such statement to City. All insurance coverages of Contractor shall be primary to any insurance or self-insurance program carried by the City applicable to this Agreement. Any such self-insurance programs or coverages shall not be contributory with any insurance required of the Contractor under the terms of this Agreement. All insurance policies, other than the Workers Compensation policy and the Surveyor's Professional Liability policy, provided by Contractor to meet the requirements of this Agreement shall name the City as an additional insured through the use of ISO Endorsement No. CG 20.10.10.01 and No. CG 20.37.10.01 wording, as to the operations of Contractor under the Contract Documents and shall also provide the Severability of Interest provision (also referred to as the Separation of Insureds provision). Companies issuing the insurance policy or policies shall have no recourse against the City for payment of premiums or assessments for any deductibles which all are at the sole responsibility and risk of Contractor.

44.3 All insurance policies to be provided by Contractor pursuant to the terms hereof shall be performable in Bay County, Florida and must expressly state that the insurance company will accept service of process in Bay County, Florida and that the exclusive venue and exclusive jurisdiction for any action concerning any matter under those policies shall be in the appropriate state court situated in Bay County, Florida.

44.4 The acceptance by the City of any Certificate of Insurance pursuant to the terms of this Agreement evidencing the insurance coverages and limits required hereunder does not constitute approval or agreement by the City that the insurance requirements have been met or that the insurance policies shown on the Certificates of Insurance are in compliance with the requirements of this Agreement.

44.5 Before starting and until completion of all Work required hereunder, Contractor shall procure and maintain insurance of the types and to the limits specified in the Contract Documents. Contractor shall require each of its Subcontractors to procure and maintain, until the completion of that Subcontractor's work or services, insurance of the types and to the limits specified in the Contract Documents, unless such insurance requirement for the Subcontractor is expressly waived or modified in writing by the City. Contractor shall not enter or otherwise occupy the Project site or commence any Work to be performed under this Agreement at the Site or any other property of the City until all insurance required hereunder has been obtained by Contractor and such proof of insurance, as the same is required under this Agreement, has been delivered to City. Contractor shall require all property insurance policies related to the Work and secured and maintained by Contractor and its Subcontractors to include provisions providing that each of their insurance

companies shall waive all rights of recovery, under subrogation or otherwise, against the City and any of its
separate contractors and the agents, employees and subcontractors of any of them.

44.6 Should at any time Contractor or any of its Subcontractors not maintain the insurance coverages required in this Agreement, the City may terminate this Agreement for Contractor default or at its sole discretion shall be authorized to purchase such coverages and charge Contractor for such coverages purchased, to include a fifteen percent (15%) administrative fee. If Contractor fails to reimburse the City for such costs within thirty (30) calendar days after demand, the City has the right to offset those costs from any amount due Contractor under this Agreement. The City shall be under no obligation to purchase such insurance, nor shall it be responsible for the coverages purchased or the insurance company/companies used. The decision of the City to purchase such insurance coverages shall in no way be construed to be a waiver of any of its rights under this Agreement. If the City exercises its option to purchase such required coverages, the coverages shall not be cancelled by Contractor and shall stay in force until the normal expiration date according to the terms and conditions of the insurance policy.

44.7 As may be required by City from time to time, the status of any insurance aggregate limits are to be confirmed in writing by the respective insurance companies. The amounts and types of insurance Contractor shall comply with all of the requirements of this Section 44 unless otherwise agreed to, in writing, by City.

END OF SECTION 00 10 00

SECTION 00 80 00

SUPPLEMENTAL CONDITIONS

PHASE 1 – GENERAL

1.1 CLAIM PERIOD

A. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

1.2 REGULAR WORKING HOURS

A. Regular working hours are defined as up to forty hours per week with a maximum of ten hours per day, Monday through Friday, beginning no earlier than 7:00 A.M. and ending no later than 5:00 P.M., excluding holidays. Any work beyond ten hours per day or forty hours per week shall be considered overtime. The Contractor shall not work on holidays. The Contract Time shall not be extended due to holidays falling within the Contract Time. Whenever the Contractor is performing any part of the Work, with the exception of equipment maintenance and cleanup, inspection by Owner's representative will be required. Requests to perform the Work at times other than during regular working hours must be submitted in writing to the Project Representative, at least 48 hours prior to any proposed weekend work or scheduled extended workweeks, to give the Owner ample time to arrange for representation and/or inspection during those periods. Periodic unscheduled overtime on weekdays will be permitted provided that two hours' notice is provided to and acknowledged in writing by the Project Representative prior to the end of the regular working day Maintenance of the Contractor's equipment and cleanup may be performed during hours other than regular working hours.

B. Contractor shall reimburse the Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of the regular working hours. At Owner's option, overtime costs may either be deducted from the Contractor's monthly payment request or deducted from the Contractor's retention prior to release of final payment.

C. Engineering/Inspection costs shall be calculated at the following rates:
   1. Field Representative $95/hour
   2. Engineer $165/hour
   3. Project Manager $210/hour

1.3 DEFECTIVE WORK

A. The Contractor shall not be entitled to an extension of the Contract Time or increase in the Contract Price for correcting or removing defective work.

1.4 CORRECTIVE WORK

A. Where defective or nonconforming Work (including damage to other work resulting therefrom) has been corrected, removed or replaced pursuant to the Contractor's obligations under the Contract Documents including Articles 16.0 and 27.0 of the General Conditions, the correction period set forth in Article 27.0 of the General Conditions with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed and accepted by the Owner.

1.5 STORED EQUIPMENT AND MATERIALS

A. The Contractor shall furnish evidence that payment received on the basis of materials and equipment, not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty (60) days of the Application of Payment on which the material/equipment first appeared. Failure to procure said evidence of payment shall result in the withdrawal of previous approval(s) and removal of the related equipment and materials from the Application of Payment.

1.6 SUBSTANTIAL COMPLETION

A. In addition to the other terms and conditions set forth in the Contract Documents, the Work will not be considered substantially complete unless and until Contractor has completed each of the following to the satisfaction of the Owner:
   1. All components of the Work have been installed, tested and approved.
   2. All repair and coating systems have been properly cured.
   3. All data specified in the Contract Documents have been delivered to the Owner.
   4. All instructions have been provided to the Project Representative in accordance with the Contract Documents.
   5. All training to be provided by Contractor pursuant to the terms of the Contract Documents has been completed.

END OF SECTION 00800

SECTION 000801

SUPPLEMENTAL

CONDITIONS

CONSTRUCTION

SCHEDULE

PART 1 – GENERAL

1.1 Construction Schedule: The Construction Schedule to be submitted by Contractor within the timeframe set forth in the Contract Documents shall be in CPM schedule format.

Contractor shall develop the schedule in Precedence Diagram Method (PDM) format, consistent with Contract milestones, showing activities for each discrete Contract activity to be accomplished within each Maintenance of Traffic phase. It shall include activities for deliverables and reviews in the schedule. Sufficient liaison shall be conducted, and information provided to indicate coordination with utility owners having facilities within the project limits. The Construction Schedule must reflect the utility requirements included in the Contract Documents, unless changed by mutual agreement of the utility company, the Contractor, the Owner and the Project Representative. The Construction Schedule shall assign calendar day durations to each activity.

Failure to include any element of work or any activity relating to utility relocation will not relieve the Contractor from completing all work within the Contract Time at no additional contract time or cost, notwithstanding prior acceptance of the schedule.

Contractor shall prepare a CPM Network Diagram in time-scale logic diagram, by week starting on Monday, grouped (banded) by work areas and sorted by early start days. Contractor shall prominently identify the critical path activities, defined as the longest continuous path of work activities and submit the Network Diagram on D size, 22 by 34 inch [559 by 864 mm] or E size, 34 by 44 inch [864 by 1,118 mm] paper.

Contractor shall submit one copy of schedule reports containing, as a minimum, identification, activity description, estimated total duration, estimated remaining duration, computed or specified early start date, computed or specified late finish date, and total float. Submit all reports on 8.5 by 11 inch [216 by 280 mm] paper,

sorted as follows:

1. Activity Report: Include activities shown on the Contract Schedule listed in order of ascending activity number.
2. Float Report: Include activities shown on the Contract Schedule listed in order of the ascending total float values.
3. Early Start Report: Include activities shown on the Contract Schedule in chronological order by early start date.
4. Predecessor/Successor Report: Include activities shown on the Contract Schedule listed in order of ascending activity numbers with the associated predecessor and successor activity numbers.
5. Narrative: Explain, in narrative form, how durations were determined and describe the proposed approach for meeting interim and final completion milestone dates specified in the Contract. Include assumptions made, restraints, critical path activities, means and methods, crews planned for each operation, equipment requirements, activities requiring overtime, additional shifts, permits, coordination requirements, long lead delivery items, or other significant requirements which would affect the ability to meet the interim and final milestone dates. Failure to include in the schedule any element of work shall not excuse the Contractor from completing all work required to achieve completion.

All submittals shall have a copy of the schedule files on a Windows compatible 3.5” diskette attached. The files shall be in one of the following formats:

1. Primavera (P3) project files using the Primavera Project Planner (latest version) “Back up” menu selection. Ensure that the option “Remove access list during backup” is checked.
2. Suretrak (latest version) “Back up” menu selection. Ensure that the option “Remove access list during backup” is checked.

The Project Representative will have 45 days to accept the Construction Schedule or to schedule a meeting with the Contractor to resolve any problems that prevent acceptance of the schedule. Contractor shall attend the meeting scheduled by the Project Representative and submit a corrected Construction Schedule to the Project Representative within seven days after the meeting. The process will be continued until a Construction Schedule is accepted by the Project Representative.

The Construction Schedule may indicate a completion date in advance of the Contract completion date. However, the Owner will not be liable in any way for the Contractor’s failure to complete the project prior to the Contract completion date. Any additional costs, including extended overhead incurred between the Contractor’s schedule completion date and the completion of Contract Time, shall be the responsibility of the Contractor. The Contractor shall not be entitled to claim or recover any such cost from the Owner.

On each Monday prior to the monthly estimate cutoff date, submit Contract Schedule, updated to reflect actual start dates, actual finish dates, added activities, changes in sequence and days remaining, to the Projective

Representative for acceptance. Include an updated Network Diagram and computer- generated reports and a narrative as herein specified. In the narrative, address changes in duration of any activity and changes to logic of activities which were performed in a sequencedifferent from those shown in the latest accepted Construction Schedule. Also addressactivities to be added to the schedule, identification of supplemental agreements and changeorders, and the incorporation of accepted schedule revisions. Any changes to the sequencing must be coordinated with the utility work shown in the plans. If the schedule provided indicates an actual or potential delay to the completion of the Contract include in the narrative a discussion of problems, causes, activities affected and describe themeans and methods to be utilized to complete the project in the authorized time. Attend meetings scheduled by the Project Representative to resolve any problems that prevent acceptance of the updated Construction Schedule and submit revised schedules as necessary for the Project Representative's acceptance. By acceptance of the Construction Schedule, theProject Representative does not endorse or otherwise certify the validity or accuracy of the activity durations or logic utilized.

The Project Representative will withhold monthly payments due for failure of the Contractor to meet the requirements for submittal and acceptance of the Construction Schedule, including the monthly updates.

1.2 WEEKLY MEETINGS

Attend weekly meetings scheduled by the Project Representative to discuss Contract progress, near term scheduled activities, including utility relocations, problems and their proposed solutions. Submit a Two-Week Planning Schedule at each weekly meeting, showing the items of work planned for the next two weeks. Develop the schedule in Bar Chart format, identifying current and planned activities and related Construction Schedule work activities, including subcontractor work. Designate all activities that are controlling work items as determined by the currently accepted Construction Schedule.

1.3 FLOAT

Float is not for the exclusive use or benefit of either the Owner or the Contractor. The Project Representative will grant time extensions only to the extent that time adjustments to the affected activities exceed the total float along the affected paths of the currently accepted Construction Schedule at the time of delay. Submit a network diagram, total float report, a narrative report to support any request for

additional Contract time.

1.4 PERFORMANCE OF WORK

By submitting a schedule, the Contractor is making a positive assertion that the Project will be constructed in the order indicated on the Construction Schedule.

Contractor shall prosecute the work in accordance with the latest accepted Construction Schedule. Any costs associated with meeting milestones and completing the Project within the authorized Contract Time will be borne solely by the Contractor.

1.5 AS-BUILT SCHEDULE

As a condition for the release of any retainage, submittals of as-built schedules which describes the actual order and start and stop times for all activities by the Contractor is required.

END OF SECTION 00 080 1

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SECTION 00 080 2

SUPPLEMENTAL CONDITIONS

PREVENTION, CONTROL AND ABATEMENT OF EROSION AND WATER POLLUTION

PART 1 – GENERAL

1.1 PRECONSTRUCTION REQUIREMENTS

At the Preconstruction Conference, Contractor shall provide to the Project Representative an Erosion Control Plan meeting the requirements or special conditions of all permits authorizing project construction and the contract requirements.

When a DEP generic permit is issued, the Contractor's Erosion Control Plan shall be prepared to accompany the Stormwater Pollution Prevention Plan (SWPPP). Contractor shall ensure the Erosion Control Plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Contractor shall not begin any soil disturbing activities until receipt of Project Representative's written approval of the Contractor's Erosion Control Plan, including required signed certification statements.

Contractor's failure to sign any required documents or certification statements will be considered a default of the Contract. Any soil disturbing activities performed by Contractor or any of its subcontractors without the required signed documents or certification statements may be considered a violation of the DEP Generic Permit.

When the SWPPP is required, Contractor shall prepare the Erosion Control Plan in accordance with the planned sequence of operations and present the Erosion Control Plan in a format acceptable to the Project Representative. The Erosion Control Plan shall include, but not be limited to, descriptions of the following items or activities:

(1) For each phase of construction operations or activities, supply the following information:
    (a) Locations of all erosion control devices
    (b) Types of all erosion control devices
    (c) Estimated time erosion control devices will be in operation

(d) Monitoring schedules for maintenance of erosion control devices
(e) Methods of maintaining erosion control devices
(f) Containment or removal methods for pollutants or hazardous wastes

(2) The name and telephone number of the person responsible for monitoring and maintaining the erosion control devices.

(3) The Erosion Control Plan submitted to the Project Representative for Engineer approval.

Contractor shall not begin construction activities until the Erosion Control Plan receives written approval from the Engineer. Contractor shall comply with the approved Erosion Control Plan.

1.2 BALES

Contractor shall provide baled hay or straw having minimum dimensions of 14 by 18 by 36 inches [350 by 450 by 900 mm] at the time of placement. Contractor shall construct baled hay or straw dams according to details shown in the plans or as directed by the Project Representative to protect against downstream accumulations of sediment.

Contractor shall use natural baled hay or straw or synthetic hay bales as an alternative to natural baled hay or straw. Synthetic hay bales should be interlocking, have pre-made stake holes, made of synthetic fibers (polypropylene, nylon, polyester) that meet the Environmental Protection Agency's TCLP standards, and be produced into a filter medium with needle-punches fibers. Contractor shall wash out and remove sediment deposits when the deposits reach ½ the height of the reusable synthetic hay bale or as directed by the Project Representative. Contractor shall dispose of the washout in an area approved by the Project Representative. Synthetic hay bales that have had sediment deposits removed may be reinstalled on the project as approved by the Project Representative.

1.3 ARTIFICIAL COVERINGS

General: Contractor shall install artificial coverings in locations where temporary protection from erosion is needed. Two situations occur that require artificial coverings. The two situations have differing material requirements, which are described below.

(1) During temporary pauses in construction caused by inclement weather or other circumstances, use artificial coverings composed of natural or synthetic fiber mats, plastic sheeting, or netting as protection against erosion, when directed by the Project Representative. Remove the material when construction resumes.

(2) While permanent grassing is being established, use artificial coverings as erosion control blankets, at locations shown in the plans, to facilitate plant

growth, in accordance with FDOT specification 104-6.4.13.

1.4 MAINTENANCE AND INSPECTION

Contractor shall provide routine maintenance of permanent and temporary erosion control features, at no additional Contract expense, until the project is complete and accepted. If reconstruction of such erosion control features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary erosion control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features at no additional Contract expense.

Contractor shall inspect all erosion control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches [12 mm] or greater. Contractor shall maintain all erosion control features as required in the SWPPP, Contractor's Erosion Control Plan and as specified in the State of Florida Department of Environmental Protection Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

1.5 MOWING

The Project Representative may require mowing by Contractor of areas within the limits of the project as deemed necessary by the Project Manager. Contractor shall mow these designated areas within seven days of receiving such order from the Project Representative. Contractor shall remove and properly dispose of all litter and debris prior to the mowing operation. Contractor shall use conventional and specialized equipment along with hand labor to mow the entire area including slopes, wet areas, intersections, and around all appurtenances. Contractor shall mow all areas to obtain a uniform height of 6 inches [150 mm], unless directed otherwise by the Project Representative.

END OF SECTION 00802

SECTION 00 08 08

SALES TAX EXEMPTION ADDENDUM

1. Contractor and City entered into a contract dated, (the "Contract") for the performance of the WORK described therein, to which an executed copy of this Sales Tax Exemption Addendum ("Addendum") shall be attached thereto and incorporated therein.

2. Contractor and City desire to enter into an arrangement whereby certain purchases under the Contract can be made through the City as a means of taking advantage of the City's status of being exempt from sales and use taxes.

3. The City is exempt from sales and use taxes. As such it is exempt from the payment of sales and use tax on purchases of building materials or equipment necessary for the performance of work under construction contracts, provided the City determines it is to its best interest to do so, and provided the purchase of such building materials and equipment are handled in the manner hereinafter described.

4. The City has determined it is in its best interest to provide the opportunity to eliminate the payments of sales tax for building materials or equipment to be used in the construction of this project and notifies the Contractor of its intent to do so.

TERMS AND CONDITIONS

1. The parties intend by this Addendum to comply with the procedures and elements described in Florida Department of Revenue Technical Assistance Advisements 01A-003 (January 8, 2001) and 00A-083 (December 21, 2000), and any conflict or ambiguity in this Addendum shall be resolved in favor of meeting the elements necessary to make tax exempt the purchases contemplated by this Addendum.

2. The City shall, at its sole discretion, have the option to purchase directly from the supplier or vendor, any building materials or equipment included in the Contractor's bid for the Contract. Contractor shall, from time to time submit, update and keep current, for consideration by the City, a list of all building materials and equipment to be purchased, organized by supplier or vendor. Such list shall include a brief description of the building materials and equipment and the name and address of the supplier or vendor. Suppliers or vendors reasonably anticipated to furnish building materials and equipment with an aggregate purchase value of less than $10,000 need not be listed.

Contractor's initial list is attached hereto and incorporated herein. Building materials and equipment not required for the performance of the Contract shall not be purchased under this Addendum. The City reserves the right to delete or add items from this Addendum when it is in the City's best interest.

3. The City will be liable for the payment of all purchases properly made hereunder.

4. Contractor shall notify all suppliers or vendors not to make sales to the Contractor under this Addendum.

5. For each purchase approved by the City to be made under this Addendum, the Contractor shall furnish the City in writing information sufficient for the City to issue to the supplier its City purchase order for the requested building materials or equipment which shall include as an attachment the City's Certificate of Exemption. Suppliers and vendors will render statements for materials purchased to the City in care of the Contractor. After receiving and inspecting the materials when they arrive at the job site, verifying that all necessary documentation accompanies the delivery and conforms with the purchase order, Contractor will forward the invoices to the City's duly authorized representative for approval, processing and delivery to the City for payment. The City will process the invoices and issue payment directly to the supplier or vendor. Contractor will keep and furnish to the City all such records, summaries, reports of purchase orders and invoices, and reports of the status and use of goods handled under this Addendum, as the City may reasonably require.

6. The Contract provides that Contractor will perform the work under the Contract for the Contract Price in the amount of $[_____], as may be amended from time to time as provided in the Contract. Said amount, as amended, due Contractor under the Contract shall be reduced by the sum of all amounts paid by the City for materials and equipment purchased under this Addendum, including any shipping, handling, insurance or other, similar charges paid by the City, and all of the savings of sales and use tax on the purchase of such items.

7. The Contractor shall submit his proposal for base bid and proposals for each Alternate with the inclusion of all required taxes including applicable sales and use tax, the same as if tax were to be paid in the normal manner. Any sales and use tax savings will be affected during the performance of the Contract.

8. Contractor shall immediately notify all subcontractors and material and equipment suppliers of the City's intent to reduce the construction cost of the Project by the purchase of building materials and equipment in the manner herein described and the Contractor shall not withhold his consent to the arrangement.

9. Administrative costs incurred by the Contractor with this Addendum shall be considered to be included in the Total Lump Sum Bid amount for the Work. No addition shall be added to the Contract Price because of the service provided by the Contractor in the purchase of building materials and equipment by the City.

10. All sales and use tax savings on the purchase of building materials and equipment shall be credited to the City and the amount of the Contract Price shall be reduced by the full amount of savings which result from the omission of payment of sales and use tax.

11. By virtue of its payment of material and equipment invoices, the City further intends to benefit from any discounts offered for timely payment to the extent of one-half of the discount offered, the remaining one-half to accrue to the Contractor as an incentive for the Contractor to process invoices well within the discount period. The Contractor shall pay any late penalties caused by its failure to facilitate the processing of invoices within the allotted time.

12. The Contractor, notwithstanding the terms and conditions of this Addendum, shall select, describe, obtain approvals, submit samples, coordinate, process, prepare shop drawings, pursue, receive, inspect, store, protect and guarantee the same as would have been the case if the tax saving procedures were not implemented.

13. The Contractor as bailee shall have the obligation of receiving, inspecting, storing and safekeeping all goods and materials purchased on behalf of the City pursuant to this Addendum. Further, the Contractor shall be responsible for the cost of replacing or repairing any goods or materials lost, stolen, damaged or destroyed while in the Contractor's possession or control as bailee, as well as processing all warranty claims for defective goods and materials to the same extent as if such goods had been Contractor-supplied or purchased in the name of the Contractor.

14. Contractor shall maintain separate accounting records for all transactions carried out under the authority granted to it under this Addendum. Such records shall be open to the City or its authorized agent during normal business hours of Contractor.

15. The City will take both legal and equitable title to the building materials and equipment received from the vendor when delivery is made by the vendor at the Project site. Without waiving or releasing Contractor from its obligations under paragraph 13 above, as equitable and legal owner of the materials and equipment purchased under this Addendum, the City shall bear the risk of loss thereto and shall have the insurable interest therein. Therefore, unless already provided for under the terms of the Contract Documents, Contractor shall cause the City to be insured or named as an additional insured as its interest may appear against any loss or damage to such goods to the extent of their full insurable value. All such insurance shall be in such form and through such companies as may be reasonably acceptable to City and Contractor shall provide City certificates thereof requiring each insurer to provide the City ten (10) days written notice in advance of cancellation or modification of coverage. Pursuant to the terms of the Contract Documents, the City will reimburse the Contractor for any additional premium amounts paid solely for such insurances against loss or damage.

16. Contractor shall be fully responsible for all matters relating to the procurement of materials and equipment covered by this Addendum, including but not limited to, overseeing that the correct materials and the correct amounts are received timely with appropriate warranties; for inspecting and receiving the goods; and for unloading, handling and storing the materials until installed. Contractor shall inspect the materials when they arrive at the Project site, verify that all necessary documentation accompanies the delivery and conforms with the City's purchase order, and forward the invoice to the City for payment if the goods are conforming and acceptable. Contractor shall verify that the materials conform to Drawings and Specifications and determine before installation that such materials are not defective. Contractor shall manage and enforce the warranties on all materials and equipment covered by this Addendum. Contractor shall be responsible to the City for its failure to fully and timely perform its obligations under this paragraph, and this Addendum generally.

17. When title to the materials and equipment covered by this Addendum passes to the City prior to being incorporated into the Work, the Contractor's possession of the goods is a bailment until such time as each of such goods is returned to the City by being incorporated into the Work.

18. The City shall not be liable for delays in the Work caused by delays in delivery of or defects in the goods covered by this Addendum, nor shall such delays or defects excuse Contractor in whole or in part from its obligation to timely perform the Contract.

19. In the event Contractor objects to the payment of any invoice for goods covered by this Addendum, Contractor shall at no additional cost to the City, provide all

assistance, records and testimony necessary or convenient for the City to resolve the supplier's claim for payment.

20. This Addendum and the authority granted to Contractor hereunder may be revoked by the City at any time upon verbal or written notice to Contractor at its offices located at , during normal business hours.

END OF SECTION 00 80 80

SECTION 000980
OTHER REQUIRED DOCUMENTS

CONTRACTOR/VENDOR E-VERIFY FORM

PER FLORIDA STATUTE 448.95, CONTRACTORS/VENDORS AND SUB-CONTRACTORS MUST REGISTER WITH AND USE THE E-VERIFY SYSTEM TO VERIFY THE WORK AUTHORIZATION STATUS OF ALL NEWLY HIRED EMPLOYEES.

THIS FORM MUST BE COMPLETED AND SUBMITTED WITH THE BID/PROPOSAL. FAILURE TO SUBMIT THIS FORM AS REQUIRED MAY DEEM YOUR SUBMITTAL NONRESPONSIVE.

The affiant, by virtue of the signature below, certifies that:

1. The Contractor/Vendor and its Subcontractors are aware of the requirements of Florida Statue 448.095.
2. The Contractor/Vendor and its Subcontractors are registered with and using the E-Verify system to verify the work authorization status of newly hired employees.
3. The Contractor/Vendor will not enter into a contract with any Subcontractor unless each party to the contract registers with and uses the E-Verify system.
4. The Subcontractor will provide the Contractor/Vendor with an affidavit stating that the Subcontractor does not employ, contract with, or subcontract with unauthorized aliens.
5. All employees hired by Contractor/Vendor on or after January 1, 2021, have had their work authorization status verified through the E-Verify system.
6. The City may terminate this contract on the good faith belief that the Contract or its Subcontractors knowingly violated Florida Statues 448.09(1) or 448.095(2)(c).
7. If this Contract is terminated pursuant to Florida Statute 448.095(2)(c), the Contractor/Vendor may not be awarded a public contract for at least one year after the date on which this Contract was terminated.
8. The Contractor/Vendor is liable for any additional cost incurred by the City as a result of the termination of this Contract.

_____
Authorized Signature

_____
Printed Name

STATE OF _____ _____
Title

COUNTY OF_____ _____
Name of Entity/Corporation

The forgoing instrument was acknowledged before me by means of ____ physical presence or _____ online notarization on, this _____ day of _____, 20 ___, by

_____ (name of person whose signature is being notarized) as the

_____ (title) of _____ (name of entity/corporation), personally know, or produced _____ (type of identification) as identification, and who did/did not take an oath.

_____
Notary Public

My Commission Expires: _____ _____
NOTARY SEAL ABOVE Printed Name

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SECTION 00 25 13 - PREBID MEETINGS

1.1 PREBID MEETING

A. **Owner** will conduct a Prebid meeting as indicated below:

1. Meeting Date: May 2, 2023
2. Meeting Time: 10:00 a.m., local time.
3. Location: City Hall, Panama City Beach

B. Attendance:

1. Prime Bidders: Attendance at Prebid meeting is recommended.
2. Subcontractors: Attendance at Prebid meeting is recommended.
3. .

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.

D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:
   a. Instructions to Bidders.
   b. Bidder Qualifications.
   c. Bonding.
   d. Insurance.
   e. Bid Form and Attachments.
   f. Bid Submittal Requirements.
   g. Bid Submittal Checklist.
   h. Notice of Award.

2. Communication during Bidding Period:

   a. Obtaining documents.
   b. Bidder's Requests for Information.
   c. Bidder's Substitution Request/Prior Approval Request.
   d. Addenda.

3. Contracting Requirements:

   a. Agreement.
   b. The General Conditions.
   c. The Supplementary Conditions.
   d. Other Owner requirements.

4. Construction Documents:

    a. Scopes of Work.
    b. Temporary Facilities.
    c. Use of Site.
    d. Work Restrictions.
    e. Alternates, Allowances, and Unit Prices.
    f. Substitutions following award.

5. Separate Contracts:

    a. Work by Owner.
    b. Work of Other Contracts.

6. Schedule:

    a. Project Schedule.
    b. Contract Time.
    c. Liquidated Damages.
    d. Other Bidder Questions.

7. Site/facility visit or walkthrough.
8. Post-Meeting Addendum.

E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

    1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 00 25 13

SECTION 00 31 19 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Existing drawings that include information on existing conditions including previous construction at Project site are available for viewing at the office of Architect.

C. Survey information that includes information on existing conditions, prepared by Emerald Coast Associates – Land Surveying & Civil Engineering, is available for at the office of Architect and as part of Drawings.

D. Related Requirements:

1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 00 31 32 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 00 31 19

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SECTION 00 31 43 - PERMIT APPLICATION

1.1 PERMIT APPLICATION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.

B. Permit Application: Complete building permit application and file with authorities having jurisdiction within five days of the date of execution of the Contract. Plan review and building permit fees shall be paid for by the Owner. Contractor shall apply and pay for trade permits.

END OF DOCUMENT 00 31 43

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SECTION 00 41 01 - TRENCH SAFETY ADDENDUM

Any trench safety excavation having a depth in excess of five (5) feet will be subject to the Excavation Safety Standards established by the Occupational Safety and Health Administration, 29.C.F.R. s. 1926.650Subpart P.

By the signature of its undersigned authorized representative, the Bidder hereby assures the Owner that any such excavation performed by the Bidder will be performed in compliance with all applicable trench safety standards.

The cost of compliance with applicable trench safety standards is estimated by the Bidder to be $_____which cost is included in the amount of bid.

The specific methods of compliance with applicable Trench Safety Standards, and the cost of complianceare as follows:

_____

_____

_____

_____

_____
AUTHORIZED OFFICIAL

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SECTION 00 65 20 - AFFIDAVIT OF PAYMENT AND RELEASE OF LIEN

Contractor shall submit AIA Document G706, "*Contractor's Affidavit of Payment of Debts and Claims*" and AIA Document G706A, "*Contractor's Affidavit of Release of Liens*", along with supporting documents listed within each document, with each Application for Payment. Contractor shall attach separate Releases or Waivers of Lien from each Contractor, Subcontractor and supplier of material and equipment represented in each Application for Payment.

END OF DOCUMENT 00 65 20

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SECTION 00 65 36 - CONTRACTOR WARRANTY FORM

PROJECT: Conservation Park Classroom

LOCATION: Griffin Rd, Panama City FL, 32415

OWNER: City of Panama City Beach

We,_____, Contractor for
(Company Name)
the above-referenced project, do hereby warrant that all labor and materials furnished and work performed are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion. This warranty commences on

_____
(Date of Substantial Completion affixed by Architect)

and expires on _____
(Expiration Date)

Should defects develop during the warranty period due to improper materials, workmanship or arrangement, the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give Contractor written notice of defective work. Should Contractor fail to correct defective work within 60 days after receiving written notice, the Owner may, at his option, correct defects and charge Contractor costs for such correction. Contractor agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

FOR _____
(Company Name)

BY _____

TITLE_____

DATE _____

END OF CONTRACTOR WARRANTY FORM

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SECTION 00 65 37 - INSTALLER WARRANTY FORM

PROJECT:

LOCATION:

OWNER:

GENERAL CONTRACTOR:

We,_____, Installer
(Company Name)

for_____, as described
(List Trade)

in Specification Section(s) _____

_____,
(List appropriate sections of Specifications)

do hereby warrant that all labor and materials furnished and work performed in conjunction with the above-referenced project are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of_____year(s) from Date of Substantial Completion. This warranty commences on

_____
(Date of Substantial Completion affixed by Architect)

and expires on_____.
(Expiration Date)

Should defects develop during the warranty period due to improper materials, workmanship or arrangement, the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give Installer written notice of defective work. Should Installer fail to correct defective work within 60 days after receiving written notice, the Owner may, at his option, correct defects and charge Installer costs for such correction. Installer agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

FOR _____	FOR _____
(General Contractor)	(Installer's Company Name)
BY _____	BY _____
TITLE _____	TITLE _____
DATE _____	DATE _____

END OF INSTALLER WARRANTY FORM 00 65 37

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CITY PERMIT

SECTION 00 70 00 – BUILDING PERMIT

PART 1 - GENERAL

1.1 SUMMARY

A. THE GENERAL CONTRACTOR WILL BE REQUIRED TO OBTAIN AND PURCHASE A BUILDING PERMIT FROM THE CITY OF PANAMA CITY BEACH PRIOR TOCOMMENCEMENT OF WORK.

B. SUBMIT TO THE CITY BUILDING DEPARTMENT TWO COMPLETED ORIGINALS OF THE APPLICATION FORM AVAILABLE THROUGH THE CITY BUILDING DEPARTMENT.

C. THE ISSUANCE OF THIS PERMIT DOES NOT PRECLUDE THE REQUIREMENT OFPERMITS BY ANY OTHER AUTHORITIES HAVING JURISDICTION.

D. IN THE EVENT THAT ANY OF THE LISTED SUBCONTRACTORS SHOULD CHANGEDURING THE COURSE OF THE CONTRACT, THE ENTIRE PERMIT APPLICATION WILL HAVE TO BE UPDATED AND A NEW BUILDING PERMIT WILL BE ISSUED.

END OF SECTION

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SECTION 00 73 80 - WEATHER DELAY LOG

A. **Project:** 21075 PCB Conservation Park Classroom Bldg. Griffin Rd. Panama City FL 32415

B. Date:

C. Weather Event:

D. Work On Progress:

E. Is the work on the Critical Path?

F. Length of Delay:

G. If the work is not on the Critical Path, how many days of delay until this work category will be on the Critical Path?

Instructions:

1. The above information is required to be submitted with each payment request on a monthly basis. The NOA weather report and superintendents daily log must be submitted with weather extension request.
2. This information will be required as back-up to grant a Time Extension request for delays caused by weather events.
3. Direct delays for work stoppages that are on the critical path will be given accordingly.
4. Delays for work not on the critical path shall be logged and delay logs for that category of work shall be accumulated and submitted in the event the work enters the critical patch and causes a delay of the project.
5. Delays will be granted only on the basis of adverse effect on the Critical Path of work for the project.

References:

SECTION 01 33 10 - WEATHER TABLE – See Adverse Weather Days
SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - Subparagraph 8.3.2:

Extension of time requests due to adverse weather shall be submitted within twenty(20) days after adverse weather. The Contractor shall submit the referenced climatologically summary data immediately upon its availability and shall show how the time extension request corresponds with the climatological data. Extension of contract time due to adverse weather shall be for "time only" and will not be the basis of any monetary claim or request for "extended general conditions."

Submitted by:

Signature:

General Contractor:

END OF SECTION 00 73 80

SECTION 008010

SUPPLEMENTAL CONDITIONS

PHASE 1 – GENERAL

1.1 CLAIM PERIOD

A. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

1.2 REGULAR WORKING HOURS

A. Regular working hours are defined as up to forty hours per week with a maximum of ten hours per day, Monday through Friday, beginning no earlier than 7:00 A.M. and ending no later than 5:00 P.M., excluding holidays. Any work beyond ten hours per day or forty hours per week shall be considered overtime. The Contractor shall not work on holidays. The Contract Time shall not be extended due to holidays falling within the Contract Time. Whenever the Contractor is performing any part of the Work, with the exception of equipment maintenance and cleanup, inspection by Owner's representative will be required. Requests to perform the Work at times other than during regular working hours must be submitted in writing to the Project Representative, at least 48 hours prior to any proposed weekend work or scheduled extended workweeks, to give the Owner ample time to arrange for representation and/or inspection during those periods. Periodic unscheduled overtime on weekdays will be permitted provided that two hours' notice is provided to and acknowledged in writing by the Project Representative prior to the end of the regular working day Maintenance of the Contractor's equipment and cleanup may be performed during hours other than regular working hours.

B. Contractor shall reimburse the Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of the regular working hours. At Owner's option, overtime costs may either be deducted from the Contractor's monthly payment request or deducted from the Contractor's retention prior to release of final payment.

C. Engineering/Inspection costs shall be calculated at the following rates:
   1. Field Representative $95/hour
   2. Engineer $165/hour
   3. Project Manager $210/hour

1.3 DEFECTIVE WORK

A. The Contractor shall not be entitled to an extension of the Contract Time or increase in the Contract Price for correcting or removing defective work.

1.4 CORRECTIVE WORK

A. Where defective or nonconforming Work (including damage to other work resulting therefrom) has been corrected, removed or replaced pursuant to the Contractor's obligations under the Contract Documents including Articles 16.0 and 27.0 of the General Conditions, the correction period set forth in Article 27.0 of the General Conditions with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed and accepted by the Owner.

1.5 STORED EQUIPMENT AND MATERIALS

A. The Contractor shall furnish evidence that payment received on the basis of materials and equipment, not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within sixty (60) days of the Application of Payment on which the material/equipment first appeared. Failure to procure said evidence of payment shall result in the withdrawal of previous approval(s) and removal of the related equipment and materials from the Application of Payment.

1.6 SUBSTANTIAL COMPLETION

A. In addition to the other terms and conditions set forth in the Contract Documents, the Work will not be considered substantially complete unless and until Contractor has completed each of the following to the satisfaction of the Owner:
   1. All components of the Work have been installed, tested and approved.
   2. All repair and coating systems have been properly cured.
   3. All data specified in the Contract Documents have been delivered to the Owner.
   4. All instructions have been provided to the Project Representative in accordance with the Contract Documents.
   5. All training to be provided by Contractor pursuant to the terms of the Contract Documents has been completed.

END OF SECTION 008010

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SECTION 01 11 00 – PRODUCT EVALUATION AND APPROVAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Florida Product Evaluation and Approval.

1.2 REFERENCES

A. Florida Statute 553.842

B. Florida Administrative Code 9B-72

C. Definition: Product evaluation and approval system that applies statewide to concurrent with the Florida Building Code.

1.3 RESPONSIBILITY

A. The Contractor is responsible for providing products approved by the State of Florida with approval numbers. **Do not use products that do not have a Florida approval number.**

1.4 SUBMITTAL

A. Submit a copy of the approved product schedule, (attached at the end of this section), to the Architect within thirty (30) days after project has been awarded. In addition to State requirements comply with the requirements of the local jurisdiction of the project.

B. Submit the following product approval specification sheet, or local jurisdiction form to obtain building permits.

1.5 CATEGORIES

A. General: Products, methods, or systems of construction, used in the exterior envelope of a building must be approved by the Building Department. The products covered are those products, methods or systems that affect the structural integrity of the building envelope, including but not limited to the following categories.
   1. Panel Walls.
   2. Exterior Doors
   3. Roofing Products.
   4. Skylights
   5. Windows
   6. Shutters
   7. Structural Components
   8. New and Innovative Building Envelope Products.

B. If the Contractor fails to comply with this requirement, non-complying components shall be removed and replaced with components that do comply at no expense to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PRODUCT APPROVAL SPECIFICATION SHEET
LOCATION: GRIFFIN ROAD, PANAMA CITY BEACH, FL 32413
PROJECT NAME: CONSERVATION PARK CLASSROOM BUILDING

As required by Florida Statute 553.842 and Florida Administrative Code 9B-72, please provide the information and the product approval number(s) on the building components listed below if they will be utilized on the construction project for which you are applying for a building permit. We recommend you contact your local product supplier should you not know the product approval number for any of the applicable listed products. More information about statewide product approval can be obtained at www.floridabuilding.org

Category/Subcategory	Manufacturer	Product Description	Approval Number(s)
A. EXTERIOR DOORS			
1. Swinging			
2. Sliding			
3. Sectional			
4. Roll up			
5. Automatic			
6. Other			
B. WINDOWS			
1. Single hung			
2. Horizontal Slider			
3. Casement			
4. Double Hung			
5. Fixed			
6. Awning			
7. Pass -through			
8. Projected			
9. Mullion			
10. Wind Breaker			
11 Dual Action			
12. Other			
C. PANEL WALL			
1. Siding			
2. Soffits			
3. EIFS			
4. Storefronts			
5. Curtain walls			
6. Wall louver			
7. Glass block			
8. Membrane			
9. Greenhouse			
10. Other			
Category/Subcategory (cont.)	Manufacturer	Product Description	Approval Number(s)
D. ROOFING PRODUCTS			
1. Asphalt Shingles			

2. Underlayment's			
3. Roofing Fasteners			
4. Non-structural Metal Roof			
5. Built-Up Roofing			
6. Modified Bitumen			
7. Single Ply Roofing Sys			
8. Roofing Tiles			
9. Roofing Insulation			
10. Waterproofing			
11. Wood shingles /shakes			
12. Roofing Slate			
13. Liquid Applied Roof Sys			
14. Cements-Adhesives – Coatings			
15. Roof Tile Adhesive			
16. Spray Applied Polyurethane Roof			
17. Other			
E. SHUTTERS			
1. Accordion			
2. Bahama			
3. Storm Panels			
4. Colonial			
5. Roll-up			
6. Equipment			
7. Others			
F. SKYLIGHTS			
1. Skylight			
2. Other			
Category/Subcategory (cont.)	Manufacturer	Product Description	Approval Number(s)
G. STRUCTURAL COMPONENTS			
1. Wood connector/anchor			
2. Truss plates			
3. Engineered lumber			
4. Railing			
5. Coolers-freezers			
6. Concrete Admixtures			

7. Material			
8. Insulation Forms			
9. Plastics			
10. Deck-Roof			
11. Wall			
12. Sheds			
13. Other			
H. NEW EXTERIOR			
ENVELOPE PRODUCTS			
1.			
2.			

The products listed below did not demonstrate product approval at plan review. I understand that at the time of inspection of these products, the following information must be available to the inspector on the jobsite; 1) copy of the product approval, 2) the performance characteristics which the product was tested and certified to comply with, 3) copy of the applicable manufacturers installation requirements.

I understand these products may have to be removed if approval cannot be demonstrated during inspection.

Contractor or Contractor's Authorized Agent Signature

Print Name Date Location Permit #

END OF SECTION 01 11 00

SECTION 012100 - ALLOWANCES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materialsand equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.
5. Testing and inspecting allowances.

C. Related Requirements:

1. Section 014000 "Quality Requirements" for procedures governing the use of allowancesfor testing and inspecting.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections.Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required tocoordinate installation.

1.5 LUMP-SUM, UNIT-COST, AND ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owneror selected by Architect under allowance and shall include taxes, freight, and delivery to Projectsite.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner.Deliver unused material to Owner's storage space as directed.

1.6 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor'srelated costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner byChange Order.

1.7 **SCHEDULE OF ALLOWANCES:**

A. **TESTING AND INSPECTING ALLOWANCES**

1. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results. Allowance to be included in bid pricing for Testing and Inspections shall be **$10,000**.

2. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidentallabor to assist the testing agency shall be included in the Contract Sum.

3. Costs of services not required by the Contract Documents are not included in theallowance.

4. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based onthe difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution ofoverhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Ordersrelated to unit-cost allowances.
4. GC Overhead and profit shall be covered in the general conditions. Allowances are solelyfor the direct payment to vendor. Any unused allowances are retained by Owner.
5. Owner reserves the right to establish the quantity of work-in-place by independent quantitysurvey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from whatcould have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower- priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

END OF SECTION 01 21 00

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SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. The cost or credit for each alternate is the net addition to or deduction from the ContractSum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate workof the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as partof alternate.
B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
C. Execute accepted alternates under the same conditions as other work of the Contract.
D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not

Used)PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. **Alternate No. 1**: Contractor to provide separate alternate price for project Furniture, Fixtures and Equipment (FF&E) as described on sheet A401. Scope includes office furniture and kitchen appliances.
B. **Alternate No.** 2: Contractor to provide separate alternate price for lighting upgrades to the existing building as shown on Sheet E-101.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION

PROCEDURESPART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 60 00 "Product Requirements" for requirements for submitting comparableproduct submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product orfabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A
2. Documentation: Show compliance with requirements for substitutions and the following,as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addressesand names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting testresults for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays indelivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicatedresults.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within
15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the followingconditions are satisfied:

a. Requested substitution is consistent with the Contract Documents and will

produceindicated results.

b.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities havingjurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitutionhas been coordinated with other portions of the Work, is uniform and consistent, iscompatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not

allowed

C. PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Project meetings.

B. Related Sections:

1. Division 01 Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is requiredto facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Sustainable design requirements.

l. Preparation of record documents.
m. Use of the premises and existing buildings.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Workand reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to doso. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of proposal requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Pending claims and disputes.
        18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

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SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Daily construction reports.
   3. Field condition reports.

1.2 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Two paper copies.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

C. Daily Construction Reports: Submit at weekly intervals.

D. Field Condition Reports: Submit at time of discovery of differing conditions.

1.3 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than 10 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

C. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:
1. Division 01 Section 013200 "Construction Progress Documentation" for submitting schedules andreports, including Contractor's construction schedule.
2. Division 01 Section 017823 "Operation and Maintenance Data" for submitting operation andmaintenance manuals.
3. Division 01 Section 017839"Project Record Documents" for submitting record Drawings, recordSpecifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings, floor plans and elevations only, will be provided upon request by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings upon request by Contractor for use in preparing Shop Drawings.
   a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the ContractTime will be authorized because of failure to transmit submittals enough in advance of the Workto permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 150 by 200 mm (6 by 8 inches) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Name of subcontractor.
h. Name of supplier.
i. Name of manufacturer.
j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Other necessary identification.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
1. Transmittal Form: Use AIA Document G810.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Action Submittals: Submit Adobe Acrobat Portable Document Format via email or a file transfer service.
2. Informational Submittals: Submit Adobe Acrobat Portable Document Format via email or a file transfer service.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
5. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
    a. Adobe Acrobat Portable Document Format via email or a file transfer service.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 215 by 280 mm (8-1/2 by 11 inches) but no larger than 600 by 900 mm (24 by 36 inches).
3. Submit Shop Drawings in the following format:
    a. Adobe Acrobat Portable Document Format via email or a file transfer service.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set; remainder will be returned.
        1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A.

1. Submit subcontract list in the following format:
   a. Number of Copies: Two paper copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

I. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

T. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

U. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads.

Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

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SECTION 01 33 10 - WEATHER TABLE

PART 1 - GENERAL

1.01 INFORMATION AND DATA

A. Information and data furnished or referred to in the weather table is furnished for the Contractor's information.

1.02 CONTRACT TIME LIMITS

A. The contract time limits include weather conditions that are shown in the table listed herein.

1.03 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

This provision specifies the procedure for the determination of time extensions for unusually severe weather affecting exterior work in accordance with the Contract. The following listing defines the monthly anticipated adverse weather for the contract period and is based on NOAA data for the geographic location of the project.

MONTHLY ANTICIPATED ADVERSE WEATHER CALENDAR DAYS
Bay County, Florida

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
5	6	6	4	5	7	8	8	6	5	4	5

This listing of anticipated adverse weather will constitute the base line monthly weather time evaluations. Throughout the contract each month, actual adverse weather days will be recorded on a calendar basis (including weekends and holidays) and compared to the monthly anticipated adverse weather in this listing. The term "actual adverse weather days" shall include days impacted by actual adverse weather. The number of actual adverse weather days affecting exterior work shall be calculated chronologically from the first to the last day in each month. Adverse weather days must prevent work for 50 percent or more of the contractor's work day and delay work critical to the timely completion of the project. If the number of actual adverse weather days exceeds the number of days anticipated in the above listing, then the Architect will determine the time extension for the Contractor for any such days that exceed the monthly baseline only provided that any such day exceeding the baseline impacts a planned work day for the Contractor (as opposed to a non-working weekend or holiday). The Architect will convert any qualifying delays to calendar days and issue a modification in accordance with the contract.

1.04 TIME EXTENSIONS

A. Time extensions for weather may be granted for weather in excess of normal that impacts ongoing activities on the site that have successive following activities that must be completed in a required sequence for completion of project within the specified performance period. These would be generally labeled as Critical Path Activities when that type of schedule is used.

B. Any request for a time extension for weather must include:

1. Weather data from National Weather Services demonstrating impact above baseline set forth in §1.03, above.
2. Impact on ongoing critical path activities.
3. Relation of those activities to completion of the project.

C. Request for time extensions as indicated above must be made within 20 days of the period of excessive weather. No time extensions will be granted for weather if not requested within 20 days as indicated above.

D. With each pay application, the Contractor shall provide a letter on the Contractor's letterhead to the Architect indicating the number of weather days and of days impacted due to the weather in excess of the baseline for that pay period and for the Project as a whole. If no weather days occurred, the contractor shall indicated 0 (zero) days.

END OF SECTION 01 33 10

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:
   1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Laboratory Mockups: Full-size, physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
   1. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
a. Allow seven days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction

AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	Association of the Wall and Ceiling Industry
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society

AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation)
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet and Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute

CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute

HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation (Now BWF)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization Available from ANSI
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.

MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association

NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute

SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc. (Now TCNA)
TCNA	Tile Council of North America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute

UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce

DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations

	Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Department of Defense Single Stock Point
	Available from Defense Standardization Program
	Available from General Services Administration
	Available from National Institute of Building Sciences
FTMS	Federal Test Method Standard (See FS)
MIL	(See MILSPEC)
MIL-STD	(See MILSPEC)
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point
UFAS	Uniform Federal Accessibility Standards Available from Access Board

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

B. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

D. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.

4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
   3. Drinking water and private toilet.
   4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
   5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead unless otherwise indicated.
   2. Connect temporary service to Owner's existing power source, as directed by Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:
   1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
   2. Utilize designated area within existing building for temporary field offices.
   3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving.
   3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary offsite parking areas for construction personnel.

F. Storage and Staging: Use designated areas of Project site for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Identification Signs: Provide Project identification signs as indicated on Drawings.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs, so they are legible at all times.

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin , furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations .
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard and replace stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.

b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Section:
   1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source,provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will no] be considered.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)If reference to a special warranty form was added where a single warranty must cover work by several contractors, insert form here and delete "Not Used" above.

3.1 END OF SECTION 01 60 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
2. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

    a. 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. Other Construction Elements: Do not cut and patch other construction elements or 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.

3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.

1.3 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."

B. In-Place Materials: Use materials for patching 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 provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. 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.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, 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.

2. No exterior concrete or asphalt paving will be cut for any reason without the expressed written permission of the School District. Directional boring is to be utilized when practical to do so.

B. Temporary Support: Provide temporary support of work to be cut.

C. 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.

D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. 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 neatly to minimum 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 31 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.

G. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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 minimize 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 new 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.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

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SECTION 017700 - CLOSEOUT

PROCEDURESPART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including,but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Occupancy: From authorities having jurisdiction.
1. By local Building Official
2. By State Fire Marshal
3. By Water Management District

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner'spersonnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified inSection 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergencyresponders.
8. Terminate and remove temporary facilities from Project site, along with mockups,construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminatevisual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **10** days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection

or notify

Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Affidavit for Final Payment and Power of Attorney from Bonding Company.
6. Completion of Department of Military Affairs closeout requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, **starting with exterior areas first**]and then interior areas[**proceeding from lowest floor to highest floor**, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel Electronic File: Architect will return annotated file.
b. PDF Electronic File: Architect will return annotated file.
c. Web-Based Project Software Upload: Utilize software feature for creating andupdating list of incomplete items (punch list).

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enablingnavigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit **on digital media acceptable to Architect**.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardousto health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certificationof Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing naturalweathering of exterior surfaces. Restore reflective surfaces to their original condition.
    c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
    e. Vacuum and mop concrete.
    f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    h. Remove labels that are not permanent.
    i. Wipe surfaces of mechanical and electrical equipment**[, elevator equipment,]** and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    l. Clean ducts, blowers, and coils **if units were operated without filters during construction or that display contamination with particulate matter on inspection**.

    m. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    n. Clean strainers.
    o. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary

Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in **Section 015000 Section 017419 "Construction Waste Management and Disposal."**

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" beforerequesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Emergency manuals.
   2. Operation manuals for systems, subsystems, and equipment.
   3. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.

B. See Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

A. Manual: Submit one electronic copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments. Submit one electronic copy of each corrected manual within 15 days of receipt of Architect's comments.
   2. Provide final manual on Compact Disc (CD) in pdf format.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect.
   7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1.
   2. Drawings: One (1) electronic copy in pdf format.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, water leak, power failure and equipment failure.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

G.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record specifications.

B. Related Requirements:
   1. Section 017300 "Execution" for final property survey.
   2. Section 017700 "Closeout Procedures" for general closeout procedures.
   3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of Record Drawings as follows:
      a. Final Submittal:
         1) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.

B. Record Specifications: Submit annotated PDF electronic files and paper copies of Project's Specifications, including addenda and Contract modifications.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Locations and depths of underground utilities.
      b. Revisions to routing of piping and conduits.
      c. Revisions to electrical circuitry.
      d. Actual equipment locations.
      e. Duct size and routing.
      f. Locations of concealed internal utilities.
      g. Changes made by Change Order or Construction Change Directive.
      h. Changes made following Architect's written orders.
   3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
   a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
   b. Architect will provide data file layer information. Record markups in separate layers.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
3. Note related Change Orders , Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.6 MISCELLANEOUS REVORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

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SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

B. See Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

B. Training Modules: For each module, include instruction for the following:
   1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipmentfunction, operating characteristics, limiting conditions, and performance curves.
   2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
   3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
   4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
   5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
   6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
   7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
   8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

SECTION 02110
SITE CLEARING

PHASE 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of site clearing is shown on drawings.

B. Site clearing work includes, but is not limited to:

1. Protection of existing trees.
2. Removal of trees and other vegetation.
3. Topsoil stripping.
4. Clearing and grubbing.
5. Removing above-grade improvements.
6. Removing below-grade improvements.

1.03 JOB CONDITIONS

A. Traffic:

1. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements:

1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
2. Protection improvements on adjoining properties and on OWNER’s property.

3. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

C. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

2. Provide temporary guards to protect trees and vegetation to be left standing.

D. Salvable Improvements:

1. Carefully remove items indicated to be salvaged, and store on OWNER's premises where indicated or directed.

PART 2 - PRODUCTS

Not applicable to work of this section.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General:

1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction.

2. Remove such items elsewhere on the site or premises as specifically indicated. Removal includes digging out stumps and roots.

3. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

B. Topsoil:

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches.

2. Satisfactory topsoil is reasonably free of topsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

3. Remove heavy growths of grass from areas before stripping.

4. Stop topsoil stripping a sufficient distance, where trees are indicated to be left standing, to prevent damage to main root system.

5. Stockpile topsoil in storage piles in areas shown, or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.

6. Dispose of unsuitable or excess topsoil same as waste material, herein specified.

C. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

2. Completely remove stumps, roots, and other debris protruding through the ground surface.

3. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

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

5. Place fill material in horizontal layers not exceeding 6-inch loose depth, and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning on OWNER's Property: Burning is not permitted on OWNER's property unless OWNER's approval is obtained and proper authorities are notified.

B. Removal from OWNER's Property: Remove waste materials and unsuitable materials from OWNER's property and dispose of off site in legal manner.

END OF SECTION 02110

SECTION 022220

TRENCHING, BACKFILLING AND COMPACTING

PHASE 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of trenching, backfilling and compacting is shown on the drawings.

B. This section includes furnishing equipment, labor and materials, and performing all operations necessary and incidental to perform the required work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 CLEARING THE SITE

A. The site of the work shall be cleared of all trees, shrubs, paving and objectionable material which interfere with the prosecution of the proposed work. Trees and shrubs which will not interfere with construction shall be protected from damage. Clearing shall be considered as an incidental item of excavation.

3.2 EXCAVATION

A. General: Perform excavation described of whatever substance encountered to the dimensions and depths specified or shown on the drawings. Undercutting will not be permitted, except when ordered by the Engineer. Material suitable for backfill shall be stockpiled near the site. Rock or other material undesirable for backfill shall be spoiled outside the area in a neat manner, as directed by the Engineer. Where it is necessaryto cut roots projecting into an excavation or where it is necessary to trim branches for equipment clearance, all severed root ends or cuts to branches over 1/2-inch diameter shall be treated with an asphalt base pruning paint. Backfill over exposed roots as soon as possible.

B. Rock: Where encountered in the trench bed, rock shall be excavated to a depth of 1/4 of the pipe diameter below the bottom of the pipe but in no case less than 4-inches. All undercut trench excavation shall be backfilledand tamped with materials as specified in the following paragraphs under Unstable Subgrade.

C. Unstable Subgrade:

1. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the drawings, the Engineer shall be notified. Such material shall be removed and replaced with suitable material. Methods and materials used for replacement shall be one of the following as directed by the Engineer in writing.
   a. Suitable earth or sand, compacted in the trench. Materials shall be furnished as a part of the Bid Proposal item covering excavation and backfill.
   b. Gravel or crushed limerock, compacted in the trench andpaid for under the appropriate item.
   c. Existing materials, stabilized after removal and then replaced and compacted in the trench at no additional cost to the Owner.

2. The Engineer shall determine the methods and materials to be used, based upon the condition of the excavation, the pipe structure to be supported, and the availability and character ofstabilizing materials.

D. Trenches:

1. Keep pipe laying operation as close to the excavation operation as possible during the prosecution of the work. The Engineer reserves the right to stop the excavation at any time when, in his opinion, the excavation is opened too far in advance of the pipe laying.

2. To prevent excess pressure on the pipe, the maximum width of trench at the top of the pipe and at the bottom of the trench shall not be greater than 2-feet more than the greatest exterior diameter of the pipe. If this maximum width is exceeded, it shall be the Contractor's responsibility to provide, at no additional cost to the Owner, such additional bedding or select backfill materials as the Engineer may require. The excavation below the spring line shall be made to conform as near as possible to the shape of the lower third of the pipe. To protect the pipe lines from unusual stresses, all work shall be done in open trenches. Excavation shall be made for bells of all pipes and of sufficient depth to permit access to the joint for construction and inspections. In no case will the bells be used to support the body of the pipe.

3. In order to avoid existing utilities, at times it may be necessary for the pipe to be laid deeper than the minimum cover specified in the preceding paragraph. At such time the Contractor will not be allowed extra compensation for additional excavation involved.

4. In case excavation has been made deeper than necessary, a layer of concrete, fine gravel or other material satisfactory to the Engineer shall be placed, at no extra cost, to secure a firm foundation for the lower third of each pipe. Where possible, excavated material shall be placed so as not to interfere with public travel. Bridging shall be provided to afford necessary access to public or private premises. Bridging shall be considered as part of the excavation operation and shall be supplied at no additional cost to the Owner.

3.3 DRAINAGE

A. Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from runninginto trenches or other excavated areas. Any water which accumulates in the excavations shall be removed promptly by well point or by othermeans satisfactory to the Engineer in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid. Bridging of dewatering pipe shall be provided where necessary. Pumps and engines for well point systems shall be operated with mufflers, and at a minimum noise level suitable to a residential area. The Contractor will not be allowed to discharge water into the Owner's storm drainage system without the written approval of theEngineer. Approval will be subject to the condition that the storm sewer be returned to its original condition.

B. The Contractor is responsible for carrying the water to the nearest ditch or body of water and for obtaining the necessary permission to use same. The Contractor shall be financially responsible for any nuisance created due to carrying off water from his drainage system.

3.4 BACKFILL

A. Trenches:

1. Trenches shall be backfilled immediately after the pipe is laid unless other protection for the pipeline is provided. Clean earth, sand, crushed limerock or other material approved by the Engineer shall be used for backfill. Backfill material shall be selected, deposited and compacted (simultaneously on both sides of the pipe) so as to eliminate the possibility of lateral displacement of the pipe. Backfill material shall solidly tamped around the pipes in layers to a level at least 1-foot above the top of the pipe. Each layer shall be compacted to a maximum thickness of 6-inches.

2. In unpaved areas, the remainder of the backfill shall be deposited

and then compacted by puddling, water flooding or mechanical tampers. Mechanical tamping of layers in unpaved areas shall be to a maximum thickness of 12-inches. In areas to be paved or repaved, the entire depth of backfill shall be deposited in layers and compacted by hand or mechanical tampers to a maximum thickness of 6-inches. Compaction shall be carried out to achieve adensity of at least 98% of the maximum density as determined by AASHTO, Method T-180. Under areas to be paved, puddling may be used for backfill consolidation after tamping to 1-foot over the pipe, as specified, provided the method is first approved by the Engineer and the density requirements are met.

3. In areas to be paved, density tests for determination of the specified compaction shall be made by a testing laboratory and spaced one in every 300-feet of trench cut. It is the intent of this specification to secure a condition where no further settlement of trenches will occur. When backfilling is completed, the roadway base for pavement replacement may be placed immediately. It will be the responsibility of the Contractor to restore the surface to the original grade wherever settlement occurs.

C. Bedding and Backfill - Flexible Sewer Pipe:

1. For polyvinyl chloride pipe, the bedding and backfill materials shall be such as to limit the vertical ring deflection to 5% of the inside pipe diameter. A deflection greater than 5% of the inside diameter shall be cause for rejection of the pipe.

2. Class IV or Class V materials as defined in ASTM D2321-74 shall not be used for bedding, haunching or initial backfill for flexible pipes.

3. For polyvinyl chloride plastic pipe, bedding shall be in accordance with ASTM D2321-74, using Class I, II or III materials, except under wet conditions. In any area where the pipe will be installed below existing or future groundwater levels or where the trench could be subject to inundation, Class I material shall be placed to the springline of the pipe.

4. A minimum of effort is needed to compact the material. However, in the initial stage of placing this type of material, take care to ensure that sufficient material has been worked under the haunchof the pipe to provide adequate side support. Take precautions to prevent movement of the pipe during placing of the material under the pipe haunch. Except for the protection of the pipe from large particles of backfill material, little care need be taken and no

compaction is necessary in placing backfill material in the balanceof the initial backfill area above the pipe. Where unstable trench wall exist because of migratory materials, such as water-bearing silts or fine sand, take care to prevent the loss of side support through the migratory action.

5. All bedding requirements for flexible pipe specified in the preceding paragraphs shall be included in the price bid for the applicable pipe material and no additional compensation for bedding material will be allowed.

D. Structural:

1. After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, forms shall be removed and the excavation shall be cleared of all trash and debris. Material for backfilling shall consist of the excavation, borrow sand or other approved materials, and shall be free of trash, lumber or other debris. Backfill shall be placed in horizontal layers not in excess of 9-inches in thickness, and have a moisture content such that a density may be obtainedto prevent excessive settlement or shrinkage. Each layer shall be compacted by hand or approved machine tampers with extreme care being exerted not to damage pipe or structures. Backfill shall be placed and compacted evenly against the exposed surfaces to prevent undue stress on any surface.

3.5 RESTORATION OF SURFACE IMPROVEMENTS

A. Roadways, including shoulders, alleys and driveways of shell, limerock, stabilized soil or gravel, grass plots, sod, shrubbery, ornamental trees, signs, fences, or other surface improvements on public or private property which have been damaged or removed in excavation, shall be restored to conditions equal to or better than conditions existing prior to beginning work. Restoration of shoulders shall consist of seeding and mulching or stabilizing with limerock as selected by the Engineer. The cost of doing this work shall be included in the cost of the various applicable items. Photographs as specified in Section 01380 - General Quality Control will be used as an aid in determining conditions prior to construction.

B. Materials for unpaved roadways, road shoulders, alleys, or driveways, shall be compacted as described in the plans. The cost of this work and furnishing new materials shall be included in the cost of the applicable items of work as no separate payment will be made, unless a separate bid item is provided.

3.6 FINE GRADING

A. Finished areas around structures shall be graded smooth and hand raked and shall meet the elevations and contours shown on the drawings. Lumber, earth clods, rocks and other undesirable materials shall be removed from the site.

3.7 DISPOSAL OF MATERIALS

A. Such portions of the excavated materials as needed and as suitable, shall be used for backfilling and grading about the completed work to the elevations as shown of the drawings or as directed. Excavated material in excess of the quantity required for this purpose shall be disposed of by the Contractor in those areas designated by the Owner and as shown on the drawings. The Contractor shall leave the earth over the trenches or other excavations in a neat and uniform condition acceptable to the Owner.

3.8 PAVEMENT REPLACEMENT

A. Asphalt pavement shall be removed by saw cutting on a straight line with edges as vertical as possible. Concrete pavement or asphalt surfaced concrete shall be removed by cutting with a concrete saw in as straight a line and vertically as possible. Materials to replace State Highway paving shall conform to the specifications required by the Florida Department of Transportation Specifications for Type SP-9.5 asphaltic concrete surface course, or as specifically shown in the plans.

B. Prior to replacing concrete or asphalt pavement replacement, a limerock base shall be laid. The base for concrete pavement shall be 6-inches of compacted thickness, and that for asphalt pavement shall be 8-inches of compacted thickness. The base course for each shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO, Method T-180. The Owner will have tests made by an independenttesting laboratory to verify compaction results. One test will be made for each block of continuous trench cut.

C. Non-asphalt pavement replacement shall be replaced of like material and thickness. Asphalt or built-up asphalt pavement shall be replaced with like material or concrete as directed by the Engineer. Where asphalt or built-up asphalt pavement is replaced by concrete, the concrete shall have a minimum of 6-inches in thickness and be reinforced with 6 by 6 no. 6 gage welded wire fabric. Concrete for paving shall be 3,000 psi design strength. Where the pavement replacement is of like material, it shall be replaced in thickness equal to or better than that existing at the time of removal.

D. Unless the base is sealed or other temporary paving applied over areas to

be repaved, pavement shall be replaced not later than 3-weeks after completion of backfill.

3.9 TESTS

A. The Contractor shall furnish facilities for making all density tests and make such restorations as may be necessary due to test operations. All density tests on backfill or base replacement will be made by a commercial testing laboratory employed by the Contractor and at all open cutroadway/driveway crossings and every 2,500 feet of pipe length. Tests shall be performed at 12” lifts at each location. If the densities as determined by the specified tests fall below the required minimums, the Contractor shall pay for all retests.

3.10 SIDEWALK, CURB AND GUTTER REMOVAL AND REPLACEMENT

A. Sidewalk, curb and gutter removal and replacement required in the construction of this work shall be done by the Contractor. Reasonable care shall be exercised in removing sidewalk and curb and gutter, and the Contractor shall either stockpile or dispose of this material as directed by the Engineer. Brick, concrete or built-up asphalt sidewalk replacement and curb and gutter replacement shall be replaced of like material in a manner and condition equal to or better than that existing at the time of removal. Materials and methods of replacing State Highway sidewalks or curbs shall conform to the Department of Transportation specifications.

END OF SECTION 02222

SECTION 025100 - Asphalt Paving

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This Section specifies the general construction requirements for all plant-mixed hot bituminous pavements.

1.02 LIMITATIONS OF OPERATIONS:

A. Weather Limitations:

1. Plant Operations shall not begin unless all weather conditions are suitable for the laying operations.

1.03 LIMITATIONS OF LAYING OPERATIONS:

A. General:

1. The mixture shall be spread only when the surface, upon which it is to be laid has been previously prepared, is intact, firm and properly cured, and is dry.

2. Unless otherwise approved by the Engineer, no mixture shall be spread that cannot be finished and compacted during daylight hours.

B. Temperature:

1. The mixture shall be spread only when the air temperature (the temperature in the shade away from artificial heat) is 40E F and above for layers greater than one inch (100 pounds per square yard) in thickness and 45E F and above for layers one inch (100 pounds per square yard) or less in thickness.

2. No mixture shall be placed when there is evidence that the base is frozen.

C. Wind:

1. The mixture shall not be spread when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or

when sand, dust, etc. are being deposited on the surface being paved, to the extent that the bond between layers will be diminished.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION OF ASPHALT CEMENT:

A. The asphalt cement shall be delivered to the asphalt plant at a temperature not to exceed 350EF and shall be maintained within a range of 230EF to 350EF in advance of mixing operations.

B. Heating within these limits shall be constant and wide fluctuations of temperature during a day's production will not be permitted.

3.02 PREPARATION OF AGGREGATES:

A. Stockpiles:

1. Each aggregate component shall be placed in an individual stockpile, which shall be separated from the adjacent stockpiles, either by space or by system of bulkheads.

2. The intermingling of different materials in stockpiles shall be prevented at all times. Each stockpile, including RAP, shall be identified as shown on the Mix Designs.

3.03 PREVENTION OF SEGREGATION:

A. In the event that the method used for stockpiling coarse aggregate results in segregation of the aggregate, the Engineer will require that the stockpiles be built up in layers not higher than four feet, with each layer completely in place before the next is started.

B. Stockpiles shall not be formed by depositing material in one place or by coning.

3.04 BLENDING OF AGGREGATES:

A. Blending or proportioning from railroad cars will not be permitted.

B. All aggregates shall be stockpiled prior to blending or placing in the cold hoppers.

C. All aggregates to be blended or proportioned shall be placed in separate bins at the cold hopper and proportioned by means of securely positioned calibrated gates or other approved devices.

3.05 COLD BINS:

A. Adequacy of Bins:

1. The separate bin compartments of the cold aggregate feeder shall be so constructed as to prevent any spilling or leakage of aggregate from one bin to another.

2. Each bin compartment shall be of such capacity and design as to permit a uniform flow of aggregates.

3. All bin compartments shall be mounted over a feeder of uniform speed, which shall deliver the specified proportions of the separate aggregates to the drier at all times.

4. If necessary, the bins shall be equipped with vibrators to insure a uniform flow of the aggregates at all times.

3.06 GATES:

A. Each bin compartment shall be provided with a gate that is adjustable in a vertical direction.

B. The gate shall be so designed that it can be held securely at any specified vertical opening.

C. The gates shall be equipped with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

3.07 MINERAL FILLER:

A. If mineral filler is required in the mix, it shall be fed or weighed-in separately from the other aggregates.

3.08 HEATING AND DRYING:

A. The aggregates shall be heated and dried before screening.

B. The temperature of the aggregates shall be heated and dried before screening.

C. The temperature of the aggregates shall be co controlled that the temperature of the completed mixture at the plant will fall within the permissible range allowed by these specifications.

3.09 SCREENING UNIT:

A. OVERSIZE AGGREGATE:

1. Any oversized pieces of aggregate shall be removed by the use of a scalping screen.

2. This oversized material shall not be returned to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.

B. SCREENING:

1. Unless otherwise permitted by the Engineer, the quantity of aggregates being discharged onto the screens shall not be in excess of the capacity of the screens to actually separate the aggregates into the required sizes.

2. A minimum of ten percent plus-ten material will be permitted in the minus-ten bin.

3. The maximum amount of minus-ten material allowed in the plus-ten bins will be determined by the Engineer, in accordance with its effect on the uniformity of the mix.

C. MIXING DIFFERENT MATERIALS:

1. Unless written permission is obtained, coarse aggregates of different types shall not be mixed; nor shall coarse aggregates of different types be used alternately in sections less than on mile in length.

3.10 PREPARATION OF THE MIXTURE

A. BATCH MIXING:

1. Aggregates:

a) The dried aggregates and mineral filler (if required), prepared in the manner previously described, and combined in batches to meet the job mix formula by weighing each separate bin size, shall be conveyed to the empty mixer.

2. Bitumen:

   a) The hot asphalt cement, accurately measured, shall be introduced into the mixer simultaneously with, or after, the hot aggregates.

   b) Mixing shall continue until the mixture is thoroughly uniform, with all particles fully coated.

3. Mixing time:

   a) The mixing time shall begin when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and shall continue until the material begins to leave the mixing unit.

   b) The mixing time will vary in relation to the nature of the aggregates and the capacity of the mixer shall be as designated by the Engineer but in no case shall it be less than 35 seconds.

B. CONTINUOUS MIXING:

1. The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the job mix formula by volumetric measurements, shall be introduced into the mixer in synchronization with the accurate feeding of the hop asphalt cement.

2. The rate of flow of material to the pug mill shall be such that the maintained depth of the mix will not exceed the tips of the paddles when in the upright position.

3. Mixing shall be sufficient to produce a thoroughly and uniformly coated mixture.

C. MIXING TEMPERATURE:

1. The ingredients of the mix shall be heated and combined in such a manner as to produce a mixture, which shall be at a temperature, when discharged from the pug mill or surge bin, within the range of 230EF to 310EF and within the tolerance shown in Table 1.

Table 1

Temperature Tolerance From Job Mix Formula

Any Single Measurement	25°F
Average of Any Five Consecutive Measurements	15°F

2. Any load or portion of a load of asphalt mix at the plant or on the road with mix temperature exceeding 335EF shall be rejected for use on the project.

3. Temperature of the completed mixture shall be determined by a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. The hole shall be located within the middle third of the length of the body, and at a distance of from six to ten inches above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the above-specified location, this will be acceptable. At the Engineer's discretion, the temperature of the load may be taken over the top of the truck in lieu of using the hole in the side of the truck.

4. The mix temperature will be taken at the plant on the first five loads each day and on an average of once every five loads thereafter. If the temperature fails to fall within the specified tolerance range, the Contractor will be required to take corrective action.

3.11 MAXIMUM PERIOD OF STORAGE:

A. The maximum time that any mix may be kept in a hot storage or surge bin is 72 hours.

3.12 CONTRACTOR'S RESPONSIBILITY FOR MIXTURE REQUIREMENTS:

A. The responsibility for producing a homogeneous mixture, free from moisture and with no segregated materials, and meeting all requirements of the specifications for the mixture, including compliance with the design limits, shall lie entirely with the Contractor.

B. These requirements shall apply also to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

3.13 TRANSPORTATION OF THE MIXTURE

A. The mixture shall be transported in tight vehicles previously cleaned of all foreign material.

B. The inside surface of the truck bodies after cleaning shall be thinly coated with soapy water or an approved emulsion containing not over five percent oil.

C. The coasting shall be applied prior to the first loading each day and repeated as necessary throughout the day's operations.

D. After the truck bodies are coated before any mixture is placed therein, they shall be raised to drain out all excess liquids.

E. Each load shall be covered during cool and cloudy weather and at any time there is a probability of rain.

3.14 PREPARATION OF APPLICATION SURFACES

A. CLEANING:

1. Prior to the laying of the mixture, the surface of the base or pavement to be covered shall be cleaned of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

B. PATCHING AND LEVELING COURSES:

1. Where a surface course is constructed on an existing pavement of old base which is irregular, and wherever so indicated in the plans, the existing surface shall be brought to proper grade and cross section by the application of patching or leveling courses.

C. APPLICATION OVER SURFACE TREATMENT:

1. Where a surface course is to be placed over a newly constructed surface treatment, all loose material shall be swept from the paving area and disposed of by the contractor.

D. COATING SURFACES OF CONTACTING STRUCTURES:

1. All structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, shall be painted with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

3.15 PLACING MIXTURE

A. Requirements Applicable To All Types:

1. Alignment of Edges:

a) All asphaltic concrete mixtures other than adjacent to curb and gutter or other true edges, shall be laid by the string line method, to assure the obtaining of an accurate, uniform alignment of the pavement edge.

2. Temperature of Spreading:

a) The temperature of the mix at the time of spreading shall be within "25E F of the established mix temperature selected by the Contractor.

b) The minimum frequency for taking mix temperatures on the road will be an average of one per five trucks. If the temperature fails to fall within the specified tolerance range, corrective action by the contractor will be required.

3. Rain and Surface Conditions:

a) Transportation of asphalt mixtures shall immediately cease from the plant when rain begins at the roadway.

b) Asphalt mixtures shall not be placed while rain is falling, or when there is water on the surface to be covered.

c) As an exception, mixture caught in transit may be placed at the Contractor's risk if the only option is to waste this mixture, and provided the surface has been tacked (as required) prior to the rain and the surface broomed in front of the spreading operation.

d) Such mixture will be evaluated separately and if it should prove unsatisfactory in any way, in the opinion of the Engineer, it shall be removed and replaced with satisfactory mixture at the Contractor's expense.

4. Speed of Spreading:

a) The forward speed of the asphalt spreader shall be as established by the Engineer.

5. Number of Crews Required:

a) For each paving machine being operated, the Contractor will be required to use a separate crew; each crew operating as a full unit.

6. Checking Depth of Layer:

a) The depth of each layer shall be checked at frequent intervals, not to exceed 25 feet.

b) Any deviation from the required thickness, in excess of the allowable tolerance, shall be immediately corrected.

7. Hand Spreading:

a) In limited areas where the use of the spreader is impossible or impracticable, the mixture may be spread and finished by hand.

8. Straight-edging and Back-patching:

a) Straight-edging and back-patching shall be done after initial compaction has been obtained and while the material is still hot.

3.16 REQUIREMENTS APPLICABLE TO COURSES OTHER THAN LEVELING:

A. Spreading and Finishing:

1. Upon arrival, the mixture shall be dumped in the approved mechanical spreader and immediately spread and struck-off to the full width required and to such loose depth for each course that, when the work is completed, the required weight of mixture per square yard, or the specified thickness, will be secured.

2. An excess amount of mixture shall be carried ahead of the screed at all times.

3. Hand raking shall be done behind the machine as required.

B. Thickness of Layers:

1. Unless otherwise noted in the plans each course shall be constructed in layers of the thickness shown on FDOT Standard Index No. 513.

2. Type S-III Asphaltic Concrete shall be constructed in layers of thickness of not less than: inch nor greater than 13 inches.

C. Laying Width:

1. If necessary due to the traffic requirements, the mixture shall be laid in strips in such a manner as to provide for the passage of traffic.

2. Where the road is closed to traffic, the mixture may be laid to the full width, by machines traveling in echelon.

D. Correcting Defects:

1. Before any rolling is started the surface shall be checked, any irregularities adjusted, and all drippings, fat sandy accumulations from the screed, and fat spots from any source shall be removed and replaced with satisfactory material.

2. No skin patching shall be done.

3. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture.

3.17 REQUIREMENTS APPLICABLE ONLY TO LEVELING COURSES:

A. Patching Depressions:

1. Before any leveling course is spread, all depressions in the existing surface more than one inch deep shall be filled by spot patching with leveling course mixture and then thoroughly compacted.

B. Spreading Leveling Courses:

1. All courses of leveling shall be placed by the use of two motor graders - one of which is equipped with a spreader box - unless otherwise shown in the plans.

2. Other types of leveling devices may be used after the Engineer has approved them.

C. Rate of Application:

1. When the total asphalt mix provided for leveling exceeds 50 pounds per square yard, the mix shall be placed in two or more layers, with

the average spread of any layer not to exceed 50 pounds per square yard.

2. When Type S-III Asphaltic Concrete is used for leveling, the average spread of a layer shall not be less than 50 pounds per square yard nor more than 75 pounds per square yard.

3. The quantity of mix for leveling shown in the plans represents the average for the entire project; however, the rate of application may vary throughout the project as directed by the Engineer.

4. When leveling in connection with base widening, the Engineer may require that all the leveling mix be placed prior to the widening operation.

D. Placing Leveling Course Over Existing Pavement:

1. When a leveling course is specified to be placed over cracked concrete pavement (including existing concrete pavement covered with an asphaltic surface), the first layer of leveling shall be placed as soon as possible but no later than 48 hours after cracking the concrete.

2. The remainder of the leveling course shall be placed in the normal sequence of operations.

E. Removal of Excess Joint Material:

1. Where a leveling course is to be placed over existing concrete pavement or bridge decks, the excess joint filler in the cracks and joints shall be trimmed flush with the surface prior to placing the first layer of the leveling course.

3.18 COMPACTING MIXTURE:

A. Provisions Applicable To All Types:

1. Equipment and Sequence:

a) For each paving or leveling train in operation, the Contractor shall furnish a separate set of rollers, with their operators.

b) The following equipment, sequence and coverage are suggested for use based on past successful performance; however, when density is required, the Contractor may select

his own equipment, sequence and coverage of rolling to meet the minimum density requirement specified. Regardless of the rolling procedure used, the final rolling must be completed before the internal pavement temperature has dropped below 175E F.

c) Seal rolling, using tandem steel rollers (either vibratory or static) weighing 5 to 12 tons, following as close behind the spreader as is possible without pickup, undue displacement or blistering of the material. Vibratory rollers shall be used in the static mode for layers of one inch or less in thickness.

d) Rolling with self-propelled pneumatic-tired rollers, following up as close behind the seal rolling as the mix will permit. The roller shall cover every portion of the surface with at least five passes.

e) Final rolling with the 8 to 12-ton tandem steel roller, to be done after the seal rolling and pneumatic-tired rolling have been completed, but before the internal pavement temperature has dropped below 175E F.

f) Once the Contractor has selected the equipment and established the rolling procedures to achieve required density, then the Contractor must continue to use the same equipment and rolling procedure for the entire project. The Engineer must be notified prior to changing the rolling process.

g) Compaction at Crossovers, Intersections, etc: when a separate paving machine is being used to pave the crossovers, one 8- to 10-ton tandem steel roller may do the compaction of the crossovers. If crossovers and intersections are placed with the main run of paving, a traffic roller shall also be used in the compaction of these areas.

2. Rolling Procedures:

a) The initial rolling shall be longitudinal. Where the lane being placed is adjacent to a previously placed lane, the center joint shall be pinched or rolled, prior to the rolling of the rest of the lane.

b) Rolling shall proceed across the mat, overlapping the adjacent pass by at least six inches. The motion of the roller shall be

slow enough to avoid displacement of the mixture, and any displacement shall be corrected at once by the use of rakes, and the addition of fresh mixture is required. Final rolling shall be continued until all roller marks are eliminated.

3. Speed of Rolling:

   a) Rolling with the self-propelled, pneumatic-tired rollers shall proceed at a speed of 6 to 10 miles per hour, and the area covered by each roller shall not be more than 3,000 square yards per hour.

4. Number of Pneumatic-tired Rollers Required:

   a) A sufficient number of self-propelled pneumatic-tired rollers shall be used to assure that the rolling of the surface for the required number of passes will not delay any other phase of the laying operation nor result in excessive cooling of the mixture before the rolling is complete.

   b) In the event that the rolling falls behind, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

5. Compaction of Areas Inaccessible to Roller:

   a) Areas which are inaccessible to a roller (such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.) shall be compacted by the use of hand tamps or other satisfactory means.

6. Correcting Defects:

   a) The rollers shall not be allowed to deposit gasoline, oil or grease onto the pavement, and any areas damaged by such deposits shall be removed and replaced as directed by the Engineer.

   b) While rolling is in progress, the surface shall be tested continuously and all discrepancies corrected to comply with the surface requirements.

   c) All drippings, fat or lean areas and defective construction of any description shall be removed and replaced.

a) Depressions that develop before the completion of the rolling shall be remedied by loosening the mixture and adding new mixture to bring the depressions to a true surface.

b) Should any depression remain after the final compaction has been obtained, the full depth of the mixture shall be removed and replaced with sufficient new mixture to form a true and even surface.

c) All high spots, high joints and honeycomb shall be corrected as directed by the Engineer.

d) Any mixture remaining unbonded after rolling shall be removed and replaced.

e) Any mixture that becomes loose or broken, mixed or coated with dirt or in any way defective, prior to laying the wearing course shall be removed and replaced with fresh mixture that shall be immediately compacted to conform with the surrounding area.

3.19 JOINTS:

A. Transverse Joints:

1. Placing of the mixture shall be as continuous as possible and the roller shall not pass over the unprotected end of the freshly laid mixture except when the laying operation is to be discontinued long enough to permit the mixture to become chilled.

2. When the laying operation is thus interrupted, a transverse joint shall be constructed by cutting back on the previous run to expose the full depth of the mat.

B. Longitudinal Joints:

1. For all layers of pavement except the leveling course, placing of each layer shall be accomplished to cause longitudinal construction joints to be offset 6 to 12 inches laterally between successive layers.

2. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

3.20 SURFACE REQUIREMENTS:

A. Contractor Responsibility:

1. The Contractor shall be responsible for obtaining a smooth surface on all pavement courses placed and therefore should straightedge all intermediate and final courses with a 15-foot rolling straightedge.

2. A 15-foot manual straightedge shall be furnished by the Contractor and shall be available at the job site at all times during the paving operation for checking joints and surface irregularities.

B. Texture of the Finished Surface of Paving Layers:

1. The finished surface shall be of uniform texture and compaction.

2. The surface shall have no pulled, torn, or loosened portions and shall be free of segregation, sand streaks, sand spots, or ripples.

3. Any area of the surface that does not meet the foregoing requirements shall be corrected.

4. Unless written permission is obtained, asphalt concrete mixtures containing aggregates which will cause a different color appearance shall not be used in the final wearing surface in sections less than one mile in length.

PART 4 – TESTING

Test results for testing asphalt densities, thickness and mix design shall be as specified by the Florida Department of Transportation Handbook for Road and Bridge Construction (latest edition).

GENERAL:

Roads less than 1,000 feet in length will require no testing. Method of construction, however, will remain consistent with FDOT Construction Requirements.

TESTING AND ACCEPTANCE:

All roads over 1,000 feet will require coring for in-place density and asphalt thickness. The cores will be cut at 1,000' intervals. All expenses for these tests are to be paid by the Contractor. All test results are to be turned in to Engineer before final 25% payment for road will be made. Payment will be based on the following table, with target density being 96% of mix design lab density.

PAYMENT SCHEDULE FOR DENSITY CORES

(Based on average density for each road)	
PERCENT OF TARGET DENSITY	PERCENT OF PAY
98.0 and above	100
97.0 to less than 98.0	95
96.0 to less than 97.0	90
Less than 96.0*	75

* If Engineer deems asphalt is acceptable to remain in place, otherwise Engineer may require removal and replacement of asphalt.

THICKNESS:

Allowable Deficiencies: The thickness shall be determined from the length of the core borings. The maximum allowable deficiency from the specified thickness shall be as follows:

1. For pavement of a specified thickness of 2½ inches or more: ½ inch.
2. For pavement of a specified thickness of less than 2½ inches: ¼ inch.

Pavement Exceeding Allowable Deficiency in Thickness:

When Deficiency is Seriously in Excess: Where the deficiency in thickness is: (1) in excess of _ inch, for pavement of less than 2½ inches in specified thickness, or, (2) in excess of ¾ inch, for pavement of specified thickness of 2½ inches or more, the Contractor shall correct the deficiency either by replacing the full thickness for a length extending at least 50 feet from each end of the deficient area, or (when permitted by the Engineer) by overlaying as directed by the Engineer.

The Contractor will receive no compensation for any pavement removed, nor for the work of removing such pavement.

When Deficiency is Not Seriously in Excess: When the deficiency in the thickness of the pavement is over ¼ inch but not more than ½ inch, for pavement of specified thickness less than 2½ inches; or when the deficiency in thickness the pavement is over ½ inch but not more than ¾ inch, for pavement of specified thickness of 2½ inches or greater; the Contractor will be allowed to leave such pavement in place, but without compensation. The areas of such pavement for which no square yard payment will be made shall be the product of the total distance between acceptable cores, multiplied by the width of the lane which was laid at the particular pass in which deficient thickness was indicated. All costs of the overlaying and compacting shall be borne by the Contractor.

Correcting Deficiency by Adding New Surface Material: For any case of excess deficiency of the pavement, the Contractor will be permitted, if approved by the Engineer for each particular location, to correct the deficient thickness by adding new surface material and compacting to the same density as the adjacent surface. The area to be corrected and the thickness of new material added shall be as specified by Engineer. All costs of the overlaying and compacting shall be borne by the Contractor.

MIX DESIGN:

An FDOT approved mix design will be provided to the Engineer or representative prior to beginning construction, and will not change without written consent of the Engineer prior to any change.

TRUCK TICKETS:

The Contractor will provide truck tickets to the Engineer or representative on a regular basis or as requested by the Engineer.

DAILY ASPHALT PLANT TESTING:

A minimum of one extraction, gradation to be done daily, as well as test performed for stability and flow to be done on each days production of 100 tons or more. The results of these tests are to be provided to the engineer on a weekly basis.

STRICT COMPLIANCE OF THIS SECTION WILL BE ADHERED TO.

END OF SECTION 02510

SECTION 031100

CONCRETE FORMING

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. CONCRETE REINFORCEMENT
B. CAST-IN-PLACE CONCRETE

1.2 DESIGN FORMWORK

A. Design Formwork for the loads, lateral pressure, and allowable stresses outlined in Chapter 1, “Guide to Formwork for Concrete” ACI 347R-94.

B. The contractor shall assume all responsibility for the design and engineering of the formwork as well as its construction and removal.

2.0 PRODUCTS

2.1 MATERIALS

A. Facing Materials shall be such as to provide the specified surface finish.

B. Form Coating shall be a field applied chemical concrete release agent capable of preventing bond between poured concrete and the form and shall contain no oil, or shall be a factory applied non-absorptive liner. Coat form before reinforcement is placed.

C. Form Ties shall be broken back at 1-inch from surface of concrete. Tie Cones, 1-inch diameter by 1-inch long, shall be used on all exposed concrete.

D. Pre-molded Expansion Joint material (PEJ) shall conform to ASTM D1751, Preformed Expansion Joint Fillers for concrete Paving and Structural Concrete (non-extruding and resilient bituminous types).”

E. Wall Slots with masonry anchors shall be one 1-inch deep 24-gauge galvanized iron.

F. Adjustable Wedge Inserts with 5/8-inch bolts and nuts shall be malleable iron, integral loop at back, slotted to receive headed bolt with provision for non-slip vertical adjustments.

2.2 FABRICATION

A. Construct Formwork so that concrete surfaces will conform to the tolerance limits specified in Table 4.3.1, “Tolerances for Formed Surfaces” ACI 301-96.

B. Provide positive means of adjustment (wedges or jacks) of shores and struts to compensate for anticipated deflections and settlement in the Formwork during

concrete placing operations.

3.0 EXECUTION

3.1 ERECTION OF FORMS

A. Build forms tight to prevent loss of mortar from the concrete.

B. Provide clean-out openings at base of pier and wall forms to facilitate cleaning and observation immediately before concrete is placed.

C. Unless shown otherwise on drawings, corners of concrete members exposed to view after all other finish materials are in place shall be beveled by the use of chamfer strips (maximum 3/4-inch across the beveled face) placed in the forms. Submit sample for approval before proceedings.

D. Overlap and hold forms against hardened concrete of a previous placement to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Install inserts and materials to be cast into concrete.

B. Set 1-inch deep 24-gauge galvanized iron wall slots in all concrete surfaces adjacent to brick or block masonry. Slots shall be set vertical in concrete surfaces and spaced 16-inches on center horizontally. Provide masonry anchors spaced 16 inches vertically in each wall slot.

C. Separate parallel runs of conduit by not less than 1-inch. Do not displace reinforcing bars from proper positions. No conduit shall be greater than ½ slab thickness. Bury conduit in slabs. Do not place conduits in thickened slab.

D. Install Adjustable Wedge Inserts at 32-inches on center in concrete for shelf angles.

3.3 CAMBER OF FORMS

A. Camber slabs at mid-span in increments of 1/8-inch per 10-foot of span and at end of cantilevers in increments of 1/8-inch per 5-foot of span unless indicated otherwise on PLANS.

B. Do not camber beams unless indicated on PLANS.

3.4 REMOVAL OF FORMS

A. Horizontal member forms used to support the weight of concrete of structural members shall remain in place until the concrete has gained not less than 2/3 of the specified 28-day strength.

B. Vertical member forms and forms not supporting the weight of concrete shall not

be removed in less than 24 hours.

3.5 RESHORING

A. Reshore new construction until concrete being supported has reached the specified 28-day strength.

B. Place no live load on new construction while reshoring.

C. Complete reshoring as soon as practicable after stripping operations but not later than the end of the working day on which stripping occurs.

D. Reshore so as to distribute construction loads safely to the ground or over sufficient number of levels in such a manner that the design LIVE LOAD of the levels supporting shores is not exceeded. Refer to GENERAL NOTES for design LIVE LOAD capacities.

END OF SECTION 031100

SECTION 032000

CONCRETE REINFORCEMENT

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. CONCRETE FORMWORK
B. CAST-IN-PLACE CONCRETE

1.2 SUBMITTALS

A. Submit in accordance with Section 03200 – Submittals reproducible of shop drawings for the fabrication and placing of reinforcing steel for approval, after being checked and approved by the Contractor and before proceeding. Any changes by Contractor or Fabricator of Contract Document Details, Materials, Member Sizes, or Reinforcement shall be “flagged” on Shop Drawings accompanied by a Written Request for Authorization and Reason for Requested Change.

B. Placing plans shall show all dimensions, details, notes, locations, sizes, lengths and each bar mark together with accessories and material belonging to the reinforcing for the concrete.

C. Schedules shall show all information and be of the same form as those on the Contract Drawings.

D. Concrete wall reinforcing shall be shown in elevation.

E. Detail all reinforcing steel in accordance with the Manual of Standard Practice for Detailing Reinforced Concrete Structures, ACI 315-92 unless otherwise indicated on the Drawings.

2.0 PRODUCTS

2.1 MATERIALS

A. Reinforcement shall be fabricated from ASTM A615-87a “Deformed Billet-Steel Bars for Concrete Reinforcement” of the grades indicated on the Drawings.

B. Welded smooth wire fabric (W) shall conform to the “Specifications for Welded Steel Wire Fabric for Concrete Reinforcement” ASTM A 185-79 and shall be fabricated from plain wire conforming to “Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement” ASTM A 82-79. Maximum wire spacing shall be 12 inches.

C. Welded deformed wire fabric (D) shall conform to “Specifications for Welded Deformed Steel Wire Fabric for Concrete Reinforcement,” ASTM-A497-79, and shall be fabricated from deformed wire conforming to “Specifications for Deformed Steel Wire for Concrete Reinforcement,” ASTM A496-78.

D. Wire bar supports shall conform to the National Bureau of Standards PS7-66, “Wire Bar Supports for Reinforced Concrete Construction.”

E. Pre-cast concrete block bar supports shall be pre-cast concrete doweled blocks or pre-cast concrete blocks with wires as indicated in the “Manual of Standard Practice for Reinforced Concrete Construction,” CRSI Handbook, Current Edition.

F. Bar supports shall be as follows:

1. On Ground: Pre-cast Concrete Block Bar supports or Class “3” Bright Basic Bar Supports with earth-bearing bases (sand plates) of 20 gauge metal;

2. Interior: Class “2” Type B Stainless Steel Protected bar supports or Class “1” Plastic Protected bar supports.

3. Exterior: Hot-dipped galvanized bar supports conforming to Table I, ASTM A153-82, or Class “1” Plastic Protected bar supports;

4. Tie wire shall not be less than 16 gauge black annealed wire.

2.2 FABRICATION

A. All hooks shall be bent using the pin diameters and dimensions as “ACI Standard Hooks” in the “Manual of Standard Practice for Reinforced Concrete Construction,” CRSI Handbook, Current Edition, unless otherwise shown on the plans.

B. Reinforcing bars shall not be bent or straightened in a manner that will injure the material.

C. Reinforcing bars shall conform to the dimensions shown on the plans and within the fabricating tolerances as shown in the “Manual of Standard Practices for Reinforced Concrete Construction,” CRSI Handbook, Current Edition.

3.0 EXECUTION

3.1 PLACEMENT/BAR REINFORCEMENT

A. Bar Reinforcement shall be placed in specified positions in the forms and held in place, before and during the placing of concrete by means of bar supports, to carry the reinforcing bars they support within the following tolerances from the positions shown on the drawings or specified herein:

1. For clear concrete protection and for depth “d” in Flexural members, walls, and compression members where “d” is:
   a. 8”(inches) or less - plus or minus ¼” (inch);

   b. More than 8 inches - plus or minus 1/2 inch; but the cover shall not be reduced by more than one-half of the specified cover.

2. For longitudinal location of bends and ends of bars:
   a. Plus or minus 2” (inches) except at discontinuous ends of members where tolerance shall be plus or minus ½”(inch).

3. For spacing:
   a. Plus or minus 2” (inches) except that total number of bars shall not be reduced.

B. Except as shown otherwise on Structural Drawings, concrete cover for Main Reinforcing Bars shall be as follows:

1. Cast against and permanently exposed to earth - 3 inches

2. Exposed to earth or weather - 2 inches

3. Interior formed surfaces:

Piers and Columns – 2” (inches)
Beams - 1½” (inches)
Walls - 1 (inch)
Slabs and Joists - ¾” (inch)

C. Vertical Bars in piers shall be offset one bar diameter at lapped splices. Furnish templates for setting dowels.

D. Bars, which are straight except for hooks, are listed in schedules as “straight” bars. Lengths shown are for straight segments, not hooks.

E. “Continuous” Bars, unless otherwise indicated on drawings, shall be lapped 30 diameters at splices. Provide Corner Bars at corner conditions.

F. Splices not shown in contract documents shall be subject to approval.

G. Support all Reinforcing Bars.

F. Space bar supports a maximum of 4-feet on center with the first support not greater than 2 feet from the ends of the bars. Tie to prevent displacement during the concreting operations. Provide #4 support bars at 48-inches spacing where not supported otherwise.

I. Reinforcement shall not be “field” bent after being embedded in hardened concrete except where specifically shown on the Drawings.

3.2 PLACEMENT/WELDED WIRE FABRIC

A. Welded Wire Fabric shall be placed in specified positions in the forms and held in place, before and during the placing of concrete, by means of Support Bars or Pre-cast Concrete Blocks with Wires. Bar supports shall be for Reinforcing Bars.

B. Straighten and lap Welded Wire Fabric not less than the spacing of the cross wires plus 2-inches and wire together at splices.

C. Welded Wire Fabric shall not be “pulled-up” into position during concrete placing operations.

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. CONCRETE FORMWORK
B. CONCRETE REINFORCEMENT
C. FIBROUS CONCRETE REINFORCEMENT
D. NORMALWEIGHT CONCRETE
E. PUMPED CONCRETE

1.2 DEFINITIONS

A. Mix Design shall mean a single tabulation showing the quantities of ingredients to produce one cubic yard of concrete of specified strength and class using a single gradation of coarse aggregate at standard slump.

B. Mix Design Series shall mean a group of mix designs of concrete of specified strength and class taking into account variation permitted by the specifications in both aggregate size and slump.

C. Slump shall be an index of consistency of a given concrete and shall be determined by the method of ASTM C143-78. Standard slump for the purpose of this specification shall be 3-inch (2-1/2 inch to 4-inch range).

D. Acceptance cylinder shall mean one compression test cylinder molded in the field, stored and cured in the field for the first 24 hours after molding, and thereafter in the laboratory until the time of testing in conformity with procedures of ASTM C-31-88.

E. Laboratory cylinder shall mean one compression test cylinder molded, stored, and cured in the laboratory for conformity with procedures of ASTM C192-88.

F. Test Strength shall mean the average breaking strength at 28 days of two acceptance cylinders tested by the method of ASTM C39-86.

G. Other definitions and terms shall be as defined in "Cement and Concrete Terminology," ACI 116-90.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330 - Submittals mix designs and materials to Designated Testing Laboratory for verifying mix design.

1.4 QUALITY ASSURANCE

A. Following the Architect's tentative acceptance of prepared mix designs, the Contractor shall submit to the Designated Testing Laboratory the concrete

materials and the concrete mix designs proposed for use. Submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. Place no concrete in the work until laboratory reports of mix designs have been received by the Architect and approved in writing by the Architect.

B. Contractor shall provide certified technician qualified under paragraph 1.4.G to sample, mould, initially cure, and transport to the laboratory the acceptance test specimens for testing. During the first 24 hours after molding, the Contractor shall provide means for maintaining the temperature immediately adjacent to the specimens within the range of 60□ F to 88□F, and for preventing loss of moisture from the specimens. After the initial curing period, the acceptance test specimens shall be transported in a damp condition to the laboratory, in a manner to maintain dampness and to prevent damage to the specimens. Include information for reporting of test data, including the following:

1. Class and strength of concrete.
2. Slump.
3. Air content.
4. Date and time of molding.
5. Location of concrete in structure.
6. Delivery ticket serial number for concrete of cylinders.
7. Name and qualification number of person responsible for molding of specimens.

C. Slump and air content shall be determined at the beginning of each day's pour and for each batch of concrete sampled for compressive strength tests. Corrections shall be made to the mix if slump or air content is not within the specified tolerances. Slump for normal weight concrete shall be determined in accordance with ASTM C143-78. Air content for lightweight concrete shall be determined in accordance with ASTM C173. Air content shall be determined in accordance with ASTM C173 or ASTM C231.

D. Sets of four acceptance cylinders for strength testing shall be made for each 50 cubic yards of concrete or fraction of each class and strength for each day's concreting and shall be molded from concrete samples taken at random over the duration of the pour.

E. Samples of concrete for strength testing SHALL BE REPRESENTATIVE of the concrete in-place in the structure and shall not be taken from the first one-third of the concrete of the ready-mix truck. NO water shall be added to the concrete after samples of concrete for strength testing have been secured.

F. Acceptance test cylinders shall be molded and cured in accordance with ASTM C31-88 from concrete sampled in accordance with ASTM C172-88.

G. Field sampling and testing shall be performed by personnel who have been certified as an ACI Concrete Field Testing Technician - Grade I as administered by the American Concrete Institute. Submit name and qualification number to the Architect for approval. Cost of certifying the contractor's representative shall be the contractor's responsibility. At the contractors option a certified technician from a commercial testing laboratory may be used who is certified as an ACI Concrete Field Testing Technician - Grade I.

1.5 QUALITY ASSURANCE

A. Designated testing laboratory shall perform all operations of testing materials and concrete and verifying mix designs.

B. Concrete Test report shall include the following which is to be supplied by the field testing technician:

1. Class and strength of concrete.
2. Slump.
3. Air Content.
4. Date and time of molding.
5. Age of test specimens.
6. Location of concrete in the structure.
7. Delivery ticket serial numbers.

C. Designated Testing Laboratory shall be selected by the Architect and paid by the Owner.

1.6 STRENGTH TESTING AND EVALUATION

A. For each set of acceptance test cylinders, one cylinder shall be broken at the age of 7 days for information and two cylinders shall be broken at the age of 28 days for acceptance. Test in accordance with ASTM C39-86. Hold one cylinder in reserve until 56 days, and then discard unless directed to test. In the event one cylinder shall exhibit damage, discard and test reserve acceptance cylinder.

B. Concrete shall be considered "Questionable Concrete" where any of the following test evaluations occur:

1. Individual test strength is BELOW SPECIFIED STRENGTH; or,
2. Samples of concrete for acceptance test cylinders are NOT REPRESENTATIVE of concrete in-place in the structure; or
3. INSUFFICIENT NUMBER of acceptance test cylinders for day's concreting was made for testing.

1.7 QUESTIONABLE CONCRETE

A. Except where core test will impair the strength of the structure, core tests as directed by the Architect shall be made at no cost to the Owner to resolve QUESTIONABLE CONCRETE. If core tests fail to demonstrate the test strength required by the contract documents or structural analysis does not confirm the safety of the structure, the Architect may, at his discretion, condemn the work or require load tests or additional construction. Should structural analysis confirm the safety of the structure, the Architect may, at his discretion, take a recommendation to the Owner that the concrete be accepted with credit for Nonconforming Work in accordance with the General Conditions.

B. The Contractor shall pay all costs incurred in providing the additional testing or analysis to resolve the acceptability of QUESTIONABLE CONCRETE.

1.8 CORE TESTS

A. Three representative cores shall be taken from each member or area of concrete for each test considered questionable. Location of cores shall be as directed by the Architect to least impair the strength of the structure. Damaged cores shall be replaced.

B. Cores shall be obtained and tested in accordance with ASTM C42-87 except that if concrete in the structure will be dry under service conditions the cores shall be air dried (temperature 60 degrees to 80 degrees F, and relative humidity less than 60%) for 7 days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.

C. Concrete in the questionable area will be considered structurally acceptable if the average of the cores is equal to or greater than 90% of the specified strength and no single core is less than 500 psi below specified strength.

1.9 LOAD TESTS AND ADDITIONAL CONSTRUCTION

A. Load Tests shall be applied and their results evaluated in accordance with Chapter 20 of ACI Building Code 318-99.

B. Work judged INADEQUATE by results of a Load Test shall be reinforced with Additional Construction or replaced, as directed by the Architect.

C. Additional Construction and replaced work shall be at the Contractor's expense.

2.0 PRODUCTS

2.1 PRODUCTION OF CONCRETE

A. Ready-mixed concrete shall be produced and delivered in accordance with the requirements of ASTM C94-86b.

B. Plant equipment and facilities shall conform to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.

C. Cement shall be measured by weight on a scale separate from those used for other materials. Cement may be measured in bags of standard weight of 94 pounds; however, no fraction of a bag shall be used in any batch. Cement temperature at time of batching shall not exceed 140 degrees F.

D. Aggregates shall be measured by weight. Batch weights shall be based on

saturated surface dry materials corrected for the actual moisture condition of the aggregate.

E. Water shall be measured by volume or by weight by devices not subject to variation due to variable pressure in the water supply line. Measuring tanks shall be provided with means for checking their calibration.

F. Devices for measuring quantities of cement, aggregates, water, and admixtures shall be accurate within one percent under operating conditions.

G. Delivery ticket shall be furnished the Contractor for each batch of concrete before unloading at the site. Time loaded, weights of fine and coarse aggregate, amount of concrete, type and quantity of admixtures, and total water as batched shall be printed on ticket by an automatic printing device, or shall be recorded and certified accurate by a Qualified Concrete Technician whose full-time duty is the batching of concrete at the batch plant. Delivery tickets, shall, in addition, include the following:

1. Name of batch plant.
2. Serial number of ticket.
3. Date and truck number.
4. Name of Contractor.
5. Job name and location.
6. Class of concrete and slump.
7. Cubic yards of concrete.
8. Time loaded.
9. Amount of water added at jobsite.
10. Initial of Job Superintendent or his authorized assistant.

2.2 FIBER REINFORCED CONCRETE

A. Introduce Synthetic Reinforcing Fibers to concrete mix after all other ingredients and before Placing Aid has been added.

B. Dosage rate shall be a minimum of 1½ pounds of fibers per cubic yard of concrete.

C. Mix for a minimum of 5 minutes to disperse fibers throughout mixture.

2.3 VAPOR BARRIER

A. Vapor barrier shall be 6-mil polyethylene film conforming to ASTM C 171-75.

B. Vapor barrier mastic shall be product of vapor barrier manufacturer.

2.4 EXPANSION JOINTS

A. Preformed expansion joints (PEJ) shall be resilient, non-extruding type, pre-molded bituminous impregnated fiberboard in sizes and indicated on the Drawings.

3.0 EXECUTION

3.1 PLACING

A. ADVANCE NOTICE shall be given the Architect 48 hours before placing concrete in any portion of the structure to permit inspection of the forms and reinforcement. All embedded items of whatever nature shall be IN-PLACE prior to inspection. An authorization of the Architect shall be secured before concrete is placed

B. Place concrete not later than 1½ hour after mixing. Mix temperature shall not exceed 105 degrees F at time of placing. Internal type mechanical vibrators and hand spading shall be used to consolidate the concrete.

C. Slump of concrete shall be 3-inch range (2 ½ to 4 inch) prior to introduction of Super-Plasticizer Placing Aid.

D. Placing Aid - High Range Water Reducing Admixture (super-plasticizer) shall be used to aid in placing slab-on-grade concrete. Slump shall be 8-inch minimum after admixture is introduced and mixed with concrete.

E. Construction joints shall be keyed and bulk headed vertically and located at the center of span unless shown on the drawings to be located elsewhere.

F. Vapor barrier shall be placed beneath interior concrete floor slabs on grade. Turn vapor barrier up at perimeter for full thickness of slab, between pre-molded expansion joint and vertical wall surface.

G. Joints in vapor barrier shall be lapped 6 inches and cemented with mastic.

H. Locate all expansion and construction joints as indicated on the Drawings.

3.2 FINISHING OF FORMED SURFACES

A. Rough Form Finish shall be confined to all concrete surfaces not exposed to view in the interior of finished spaces or not exposed to view on the exterior of the finished building. After removal of forms, tie holes and defects greater than 1/4 inch in depth shall be patched. Fins exceeding 1/4 inch in height shall be chipped or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

B. Other than surfaces to be sandblasted, smooth Rubbed Finish shall be provided for all concrete surfaces exposed to view in the interior of finished spaces or exposed to view on the exterior of the finished building. Form facing material shall produce a smooth, hard, uniform texture on the concrete. Form material with raised grain, torn surfaces, worn edges, patches, dents, or defects, which will impair the texture of the concrete surface, shall not be used. Tie holes and defects shall be patched; fins shall be removed.

1. An area at least 20 square feet in an inconspicuous location shall be

selected by the Architect for sample panel of this finish. Sample finish shall be matched in the completed work.

2. No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning, as the work progresses shall not be permitted.

3. Mix one part Portland cement and 1.5 parts fine sand with water to produce a grout having the consistency of thick paint. Wet the surface of the concrete to prevent absorption of water from the grout and apply the grout uniformly with brush or spray gun; fill all voids and depressions.

4. Immediately after applying the grout, scrub the surface with a cork float or stone to coat the surface, fill all bubbles and holes, to produce uniformly planed surfaces.

5. While the grout is still plastic, remove all excess grout by working the surface with a rubber float or sack. After the surface whitens from drying (about 30 minutes at normal temperature), rub with clean burlap.

6. Cure finish by maintaining damp for not less than 48 hours after final rubbing.

3.3 SLABS

A. Edge forms and intermediate screed strips shall be set to produce the designated elevations and contours of the finished surface, and to maintain designated concrete thickness.

B. Place and consolidate the concrete to produce a surface within the tolerances specified herein. Test for grade (or level) and correct by removing excess or adding and compacting additional concrete. These operations must be performed before bleeding water has an opportunity to collect on the surface.

C. Joints shall be located and constructed as detailed on the drawings. Where saw-cut joints are shown on the drawings, cutting shall be started as soon as the concrete has hardened to prevent aggregates being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

D. Scratched Finish shall be applied to surfaces that are to receive bonded applied cementitious applications. Depress slabs for applied finish. All pitches to drains shall be made in the concrete slab and not the setting bed. Level to a Class “C” tolerance and roughen the surface with stiff brushes or rakes before final set. Before the concrete has hardened, remove laitance and loose aggregate from the surface.

E. Floated Finish shall be applied to surfaces to receive permanent roofing, waterproofing membranes, or sand bed applied finish. Level to a Class “B” tolerance and float to a uniform sand texture. Floating shall begin when the

surface has stiffened to prevent fine material from working to the top (when the sheen or shiny film of water on the surface has disappeared.)

F. Troweled Finish shall be applied to floors or walking surfaces to receive contact floor coverings. Surface shall first be float finished as specified above. It shall next be power troweled and finally hand troweled. Final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The finished surface shall be free of trowel marks, uniform in texture and appearance and shall be planed to a Class “A” tolerance, except tolerances for concrete on metal deck shall be Class “B”. Any defects of sufficient magnitude to show through floor covering shall be removed by grinding.

G. Light Broom Finish shall be applied to sidewalks, parking slabs, and ramps. Surfaces shall first be float finished as specified above and then immediately it shall be given a coarse transverse scored texture by drawing a broom across the surface in one direction, uniformly done to produce uniform surface texture. Prepare sample for Architects approval prior to beginning.

H. Tolerance for finish surfaces shall be determined by a straightedge placed anywhere on the surface in any direction.
1. Class A: 1/8 inch in 10 feet.
2. Class B: 1/4 inch in 10 feet.
3. Class C: 3/8 inch in 10 feet.

I. Non-slip finish shall be applied to all stair treads and concrete filled treads. Surfaces shall first be float finished as specified above and shall then receive a "dry shake" application of crushed, ceramically bonded, aluminum oxide blended with Portland cement in proportions recommended by the manufacturer of the aggregate. Apply the blended material in an even coverage of the surface without segregation in two applications at right angles to one another. After each application, float immediately into the surface. The rate of application shall be not less than 25 pounds of abrasive particles per 10 square feet of area. Finish to a "troweled finish" surface.

3.4 CURING AND PROTECTION

A. Immediately after placement, concrete shall be protected from premature drying, hot or cold temperatures, and mechanical injury.

B. Cure all surfaces for a minimum period of 10 days, and additional time for the average compressive strength to reach 67% of specified strength. Curing shall be by moist curing with sand kept continuously wet, waterproof curing paper (ASTM C171-86) or liquid membrane forming curing compound. Selection of curing method shall be compatible with the finish to be applied to the concrete surface and acceptable to the Architect.

C. Moist curing shall be by immediately covering all floors and roofs with 1/2 inch of sand. Standard seep hose shall then be laid in parallel runs at 8'-0" on center and the slab kept damp for the curing period.

D. Waterproof curing paper shall conform to ASTM C171-86. Maintain curing paper in-place for the curing period.

E. Liquid membrane-forming curing compound shall have a minimum solids content by weight of 16%; shall conform to the requirements of ASTM C309-92 "Liquid Membrane-Forming Compounds for Curing Concrete," Type 1; and shall not require removal for bonding of paint and floor covering adhesives. Use directly from the container without diluting within one hour after final finishing in one-coat at a coverage not to exceed 200 square feet per gallon for surfaces with a "floated" or "broom" finish, nor 300 square feet per gallon for surfaces with a "Troweled" finish. Submit Engineering Testing Laboratory certification for approval.

F. Cold weather protection shall be in accordance with recommended practices of ACI 306-78 "Cold Weather Concreting." Whenever the mean daily outdoor temperature is less than 40 degrees F, the temperature of the concrete shall be maintained between 50 degrees F and 70 degrees F for the curing period.

G. Hot weather protection shall be in accordance with ACI 305-77, "Hot Weather Concreting." When the anticipated ambient air temperature exceeds 80 degrees F during placing or finishing operations, a retarding admixture shall be used in the mix to retard the setting time of the concrete.

3.5 REPAIR OF DEFECTS

A. Inspection by the Architect shall determine whether or not the work is acceptable; and if repairable, the method of repair to be used. Defects in materials and workmanship shall be subject to the inspection at all times during the progress of the work regardless of the previous inspections.

B. Work condemned by the Architect shall be removed and replaced, at the Contractor's expense, with work that will conform to the Contract Documents.

C. Surface defects which are 1.5 inches or less in depth, including tie holes, shall be repaired by patching the same working day the forms are removed. Defect shall be cut back at least 1 inch at 90 degrees F to the surface (without feather edges) to sound concrete. After soaking with water, a stiff mortar shall be packed into the defect. The mortar mix shall be determined by trial method using a mixture of white and grey Portland cement to produce the desired color. After mortar has attained its initial set, the patch shall be scraped or rubbed flush with the concrete and match the color and texture of the adjoining surface. Upon completion, if the quality of the repair work set forth above is not such as to be acceptable to the Architect, the defective members shall be removed and replaced at no cost to the Owner.

END OF SECTION 033000

SECTION 033100
CONCRETE WORK

PHASE 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of concrete work is shown on Drawings.

1.03 SUBMITTALS

A. Product Data:

1. Submit data proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by ENGINEER.

B. Shop Drawings, Reinforcement:

1. Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement.

2. Comply with American Concrete Institute (ACI) 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures” showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement.

3. Include special reinforcement required for openings through concrete structures.

C. The ENGINEER’s review is for general engineering applications and features only. Design of formwork for structural stability and efficiency is the CONTRACTOR’s responsibility.

D. Laboratory Test Reports:

1. Submit laboratory test reports for concrete materials and mix design test.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

a) ACI 301 “Specifications for Structural Concrete for Buildings.”

b) ACI 318 “Building Code Requirements for Reinforced Concrete.”

c) Concrete Reinforcing Steel Institute (CRSI) “Manual of Standard Practice.”

B. Concrete Testing Services:

1. A testing laboratory shall be engaged that is acceptable to the ENGINEER to perform material evaluation tests and to design concrete mixes.

2. Materials and installed work may require testing and retesting at anytime during progress of work.

3. Tests, including retesting of rejected materials for installed work, shall be done at the CONTRACTOR’s expense.

1.05 PROJECT CONDITIONS

A. Protect Footings Against Freezing:

1. Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against the possibility of freezing.

2. Maintain cover for time period as necessary.

B. Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete:

1. Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.

2. Furnish in largest practicable sizes to minimize number of joints.

B. Use plywood complying with U. S. Product Standard PS-1 “B-B (Concrete Form) Plywood,” Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

C. Forms for Unexposed Finish Concrete:

1. Plywood, lumber, metal, or other acceptable material.

2. Provide lumber dressed on at least two edges and one side for tight fit.

D. Form Coatings:

1. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

E. Form Ties:

1. Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

2. Provide units which will leave no metal closer than 1 ½ inches to surface.

3. Provide ties which, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars:

1. American Society of Testing and Materials (ASTM) A 615

2. Grade 60.

3. Deformed.

B. Steel Wire:

1. ASTM A 82

2. Plain.

3. Cold-drawn steel.

C. Welded Wire Fabric:

1. ASTM A 185.

2. Welded steel wire fabric.

D. Welded Deformed Steel Wire Fabric:

1. ASTM A 497.

E. Supports for Reinforcement:

1. Use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place.

2. Use wire bar type supports complying with CRSI specifications.

F. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

A. Portland Concrete:

1. ASTM C 150, Type I.

2. Use one brand of cement throughout project, unless otherwise acceptable to the ENGINEER.

B. Normal Weight Aggregates:

1. ASTM C 33, and as herein specified.

2. Provide aggregates from a single source for exposed concrete.

3. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

C. Water:

1. Drinkable.

2.04 RELATED MATERIALS

A. Polyvinyl Chloride (PVC) Waterstops:

1. Corps of Engineers CRD-C 572.

2. Available Manufacturers:

3. Manufacturer: Subject to compliance with requirements, provide products of one of the following or equal:

   a. AFCO Products.

   b. The Burke Co.

   c. Edoco Technical Products.

   d. Greenstreet Plastic Products.

   e. Harbour Town Products.

   f. W. R. Meadows.

   g. Progress Unlimited.

   h. Schleigel Corp.

   i. Vinylex Corp.

B. Granular Base:

1. Use evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

C. Vapor Retarder:

1. Provide vapor retarder cover over prepared base material where indicated below slabs on grade.

2. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:

   a. Polyethylene sheet not less than 8 mils thick.

   b. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.

3. Products: Subject to compliance with requirements, provide one of the following or equal:

   a. Metallic:

      1) “Vibrofoil,” A. C. Horn, Inc.

      2) “Metallic Spec. Grout,” The Burke Co.

3) “Embeco 636,” Master Builders.

4) “Ferrolith GDS,” Sonneborn-Rexnord.

5) “Hi-Mod Grout,” Euclid Chemical Co.

6) “Kemox G,” Sika Chemical Co.

7) “Ferrogrout,” L & M Const. Chemical Co.

8) “Supreme Plus,” Gifford-Hill/American Admixtures.

b. Non-Metallic:

1) “Set Grout,” Master Builders.

2) “Sonogrout,” Sonneborn-Rexnord.

3) “Euco-NS,” Euclid Chemical Co.

4) “Supreme,” Gifford-Hill/American Admixtures.

5) “Crystex,” L &M Const. Chemical Co.

6) “Sure-Grip Grout,” Dayton Superior Corp.

7) “Horngrout,” A. C. Horn, Inc.

8) “Five Star Grout,” U. S. Grout Corp.

D. Liquid Membrane-Forming Curing Compound:

1. Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A.

2. Moisture loss not more than 0.055 grams per square centimeter (gr./sq. cm.) when applied at 200 square feet per gallon (sq. ft./gal).

3. Products: Subject to compliance with requirements, provide one of the following or equal:

a. “Masterseal,” Master Builders.

b. “A-H 3 Way Sealer,” Anti-Hydro Waterproofing Co.

c. “Ecocure,” Euclid Chemical Co.

d. “Clear Seal,” A. C. Horn, Inc.

e. “Sealco 309,” Gifford-Hill/American Admixtures.

f. “J-20 Acrylic Cure,” Dayton Superior.

g. “Spartan-Cote,” The Burke Co.

h. “Sealkure,” Toch Div. – Carboline.

i. “Kure-N-Seal,” Sonneborn-Rexnord.

j. “Polyclear,” Upco Chemical/USM Corp.

k. “L & M Cure,” L & M Construction Chemicals.

l. “Klearseal,” Setcon Industries.

m. “LR-152,” Protex Industries.

n. “Hardtop,” Gifford-Hill.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If a trial batch method is used, use an independent testing facility acceptable to the ENGINEER for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Submit written reports to Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the ENGINEER.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. 4,000 pounds per square inch (psi) 28-day compressive strength; W/C ratio, 0.44 maximum (non-air-entrained).

2. 3,000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained).

3. 2,500 psi 28-day compressive strength; W/C ratio, 0.67 maximum (non-air-entrained).

D. Lightweight Concrete:

1. Proportion mix as herein specified.

2. Design mix to produce strength and modulus of elasticity as noted on Drawings, with a split-cylinder strength factor (Fct) of not less than 5.5 for 3,000 psi concrete and a dry weight of not less than 95 pounds (lbs) or more than 110 lbs. after 28 days.

3. Limit shrinkage to 0.03 percent at 28 days.

E. Adjustment to Concrete Mixes:

1. Mix design adjustments may be requested by the CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the OWNER and as accepted by the ENGINEER.

2. Submit laboratory test data for revised mix design and strength results to the ENGINEER for acceptance before using in work.

F. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at Manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1½ percent within the following limits:

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.

2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.

3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site-verified 2 to 3 inches slump concrete.

4. Other concrete: Not less than 1 inch and not more than 4 inches.

2.06 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 FORM

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

C. Maintain formwork construction tolerances complying with ACI 347.

D. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

E. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures.

F. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required for this Work.

G. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

H. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

I. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

J. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.

K. Provide Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

L. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

1. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar.

2. Locate temporary openings on forms at inconspicuous locations.

M. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

N. Provisions for Other Trades:

1. Provide openings in concrete formwork to accommodate work of other trades.

2. Determine size and location of openings, recesses, and chases from trades providing such items.

3. Accurately place and securely support items built into forms.

4. Other trades shall provide location and size of openings. The forms for such openings shall be constructed and set in place under this section.

O. Cleaning and Tightening:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.

2. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.

3. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.03 VAPOR RETARDER INSTALLATION

A. Place vapor retarder sheeting with longest dimension parallel with direction of pour following the completion of leveling and tamping of granular base for slabs on grade.

B. Lap joints 6 inches and seal with appropriate tape.

3.04 PLACING REINFORCEMENT

A. Comply with CRSI’s recommended practice for “Placing Reinforcing Bars,” for details and methods of reinforcement placement and supports, and as herein specified.

B. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

D. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

E. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

F. Place reinforcement to obtain at least minimum coverages for concrete protection.

1. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.

2. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire fabric in as long lengths as practicable.

1. Lap adjoining pieces at least one full mesh and lace splices with wire.

2. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.05 JOINTS

A. Construction Joints:

1. Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER.

2. Place construction joints perpendicular to main reinforcement.

3. Continue reinforcement across construction joints, except as otherwise indicated.

B. Waterstops:

1. Provide waterstops in construction joints as indicated.

2. Install waterstops to form continuous diaphragm in each joint.

3. Make provisions to support and protect exposed waterstops during progress of work.

4. Fabricate field joints in waterstops in accordance with Manufacturer's printed instructions.

C. Isolation Joints in Slabs-on-Ground:

1. Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

3.06 INSTALLATION OF EMBEDDED ITEMS

A. General:

1. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

2. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

3.07 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required returning forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound Manufacturer's directions.

D. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed.

E. Apply in compliance with Manufacturer's instructions.

3.08 CONCRETE PLACEMENT

A. Pre-Placement Inspection:

1. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in.

2. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

3. Moisten wood forms immediately before placing concrete where form coatings are not used.

4. Apply temporary protective covering to lower 2 feet of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

B. General:

1. Comply with ACI 304 “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete,” and as herein specified.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has sufficiently hardened to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

3. Placing Concrete in Forms:

a Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints.

b Where placement consists of several layers, place each layer while the preceding layer is still plastic to avoid cold joints.

c Consolidation of Concrete:

1) Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping.

2) Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

3) Do not use vibrators to transport concrete inside forms.

4) Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.

5) Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer.

6) Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of

vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

4. Placing Concrete Slabs:

   a Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

   b Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

   c Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface; free of humps or hollows.

   d Do not disturb slab surfaces prior to commencement of finishing operations.

   e Maintain reinforcing in proper position during concrete placement operations.

5. Cold Weather Placing:

   a Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

   b When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit (F)/4 degrees Celsius (C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 Degrees F (27 degrees C) at point of placement.

   c Do not use frozen materials or materials containing ice or snow.

   d Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

   e Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

6. Hot Weather Placing:

   a When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

   b Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C).

   c Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water.

   d Use of liquid nitrogen to cool concrete is the CONTRACTOR's option.

   e Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the temperature of the steel does not exceed the ambient air temperature immediately before embedment in concrete.

   f Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

   g Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.09 FINISH OF FORMED SURFACES

A. Rough Form Finish:

1. For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated.

2. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish:

1. For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material directly applied to the concrete, or a covering material directly applied to the concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system.

2. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams.

3. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish:

1. Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment.

2. Combine one part Portland cement to 1½ parts fine sand by volume, and mix with water to consistency of thick paint.

3. Use proprietary additives at the CONTRACTOR's option.

4. Blend standard Portland cement and white Portland cement (amounts determined by trial patches) so that final color of dry grout will match adjacent surfaces.

5. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes.

6. Remove excess grout by scraping and rubbing with clean burlap.

7. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces:

1. Strike-off smooth tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces and finish with a texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

A. ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number System (inch-pound-units)," shall be used for these finishes as follows:

1. Scratch Finish:

    a. Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

    b. After placing slabs, plane surface to tolerances for floor flatness (FF) of 15 and floor levelness (FL) of 13.

    c. Slope surfaces uniformly to drain where required.

    d. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

2. Float Finish:

    a. Apply float finish to monolithic slab surface to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

    b. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.

    c. Begin floating when surface water has disappeared or when concrete has sufficiently stiffened to permit operation of power-driven floats, or both.

    d. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.

    e. Check and level surface plane to tolerances of FF 18 - FL 15.

    f. Cut down high spots and fill low spots.

    g. Uniformly slope surfaces to drains.

    h. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3. Trowel Finish:

    a. Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring,

carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

b. After floating, begin first trowel finish operation using a power-driven trowel.

c. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.

d. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF 20 - FL 17.

e. Grind smooth surface defects which would telegraph through applied floor covering system.

4. Trowel and Fine Broom Finish:

a. Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

5. Non-Slip Broom Finish:

a. Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

b. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.

c. Coordinate required final finish with the ENGINEER before application.

3.11 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

3. Continuously keep concrete moist for not less than 7 days, weather permitting.

4. Begin final curing procedures immediately following initial curing and before concrete has dried.

5. Continue final curing for at least 7 days in accordance with ACI 301 procedures.

6. Avoid rapid drying at end of final curing period.

B. Curing Methods:

1. Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

2. Provide moisture curing by the following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and continuously keeping wet.

d. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

3. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape of adhesive.

b. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

4. Provide curing slabs and sealing compounds to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours).

b. Uniformly apply in continuous operation by power-spray or roller in accordance with Manufacturer’s directions.

c. Recoat areas subjected to heavy rainfall within 3 hours after initial application.

d. Maintain continuity of coating and repair damage during curing period.

5. Do not use membrane curing compounds on surfaces that are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile and glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the ENGINEER.

6. Curing Formed Surfaces:

a. Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed.

b. If forms are removed, continue curing by methods specified above, as applicable.

7. Curing Unformed Surfaces:

a. Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

b. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

8. Sealer and Dustproofer:

a. Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 SHORES AND SUPPORTS

A. Remove shoring from ground to roof for structures four stories or less, unless otherwise permitted.

B. Remove shores and re-shore in a planned sequence to avoid damage to partially cured concrete.

C. Locate and provide adequate re-shoring to safely support work without excessive stress or deflection.

D. Keep shores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.13 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at no less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.14 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces.

B. Apply new form coating compound as specified for new formwork.

C. Thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints when forms are extended for successive concrete placement.

D. Align and secure joint to avoid offsets. Do not use “patched” forms for exposed concrete surfaces, except as acceptable to the ENGINEER.

3.15 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In:

1. Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place.

2. Mix, place, and cure concrete as herein specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs:

1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Provide machine and equipment bases and foundations, as shown on Drawings.

2. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of Manufacturer furnishing machines and equipment.

3. Grout base plates and foundations as indicated, using specified non-shrink grout.

4. Use non-metallic grout for exposed conditions, unless otherwise indicated.

D. Reinforced Masonry:

1. Provide concrete grout for reinforced masonry lintels and bond beams where indicated on Drawings and as scheduled, including filling of concrete modular unit cavities where called for on plans.

2. Maintain accurate location of reinforcing steel during concrete placement.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the ENGINEER.

2. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch.

3. Make edges of cuts perpendicular to the concrete surface.

4. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent.

5. Place patching mortar after bonding compound has dried.

B. Repair of Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the ENGINEER. Surface defects, as such, include:

a. Color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets.

b. Fins and other projections on surface.

c. Stains and other discolorations that cannot be removed by cleaning.

2. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

3. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish.

2. Correct low and high areas as herein specified.

3. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

D. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

1. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

2. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete.

3. Finish repaired areas to blend into adjacent concrete.

4. Proprietary patching compounds may be used when acceptable to the ENGINEER.

E. Repair Defective Areas:

1. Cut out and replace with fresh concrete except random cracks and single holes not exceeding 1 inch in diameter.

2. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾-inch clearance all around.

3. Dampen concrete surfaces in contact with patching concrete and apply bonding compound.

4. Mix patching concrete of same materials to provide concrete of same type or class as original concrete.

5. Place, compact, and finish to blend with adjacent finished concrete.

6. Cure in same manner as adjacent concrete.

F. Perform structural repairs with prior approval of Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

G. Use repair methods not specified above, subject to acceptance of the ENGINEER.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The OWNER will employ a testing laboratory to perform tests and to submit test reports.

B. Sampling and testing for quality control during placement of concrete may include the following, as directed by the ENGINEER.

1. Sampling Fresh Concrete:

   a. ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump:

   a. ASTM C 143, one test at point of discharge for each day's pour of each type of concrete and additional tests when concrete consistency seems to have changed.

3. Concrete Temperature:

   a. Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above, and each time a set of compression test specimens are made.

4. Compression Test Specimen:

a. ASTM C 31, one set of four standard cylinders for each compressive strength test, unless otherwise directed.

b. Cylinders for laboratory cured test specimens shall be molded and stored except when field-cure test specimens are required.

5. Compressive Strength Tests:

a. ASTM C 39, one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any 1 day:

1) One specimen tested at 7 days.

2) Two specimens tested at 28 days.

3) One specimen retained in reserve for later testing if required.

b. When frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or form each batch if fewer than five are used.

C. Test results will be reported in writing to Structural Engineer and the CONTRACTOR within 24 hours after tests.

D. Reports of compressive strength tests shall contain:

1. The project identification name and number.
2. Date of concrete placement.
3. Name of concrete testing service.
4. Concrete type and class.
5. Location of concrete batch in structure.
6. Design compressive strength at 28 days.
7. Concrete mix proportions and materials.
8. Compressive breaking strength.
9. Type of break for both 7- and 28-day tests.

E. Nondestructive Testing:

1. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. Additional Tests:

1. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER.

2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3. The CONTRACTOR shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

SECTION 033110

NORMAL WEIGHT CONCRETE

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. CONCRETE FORMWORK
B. CONCRETE REINFORCEMENT
C. FIBROUS CONCRETE REINFORCEMENT
D. CAST-IN-PLACE CONCRETE
E. PUMPED CONCRETE

1.2 SUBMITTALS

A. Submit in accordance with Section 01330 – Submittals mix design series and value of standard deviation where available, for each class of concrete specified herein. Class of concrete and test strength shall be as follows:

Class of Concrete	Compressive Test Strength
Class AA	4000-psi
Class A	3000-psi

B. Submit certification and technical literature for Admixtures proposed for use.

C. Supply the designated testing laboratory with samples of the materials proposed for use for verification of the mix design.

D. Test reports shall show the requirements of the applicable ASTM specifications.

1.3 VERIFICATION OF MIX DESIGNS

A. The Testing Laboratory designated for project testing shall verify all mix designs using the material and mix design proposed for use by the Contractor.

B. Laboratory strength tests with both air content equal to 5% and slump equal to 4 inches shall produce an average compressive strength at the designated test age not less than as required by paragraph STATISTICAL MIX DESIGN OR TRIAL BATCH MIX DESIGN below.

C. If during the progress of the work test data becomes available from the job to establish a standard deviation greater than that used to verify the average strength, the Architect may require an increase to the cement factor of the mix to increase the average strength to that required by the established standard.

2.0 MATERIALS

2.1 CEMENTITIOUS MATERIALS SHALL BE ONE OF THE FOLLOWING:

A. Portland cement shall be a domestic brand conforming to the requirements of

ASTM C 150-00, Low Alkali, Type I or Type III. Submit certification of compliance.

B. Blend of 50% (maximum) Blast-Furnace Slag for Use in Concrete and Mortars ASTM C 989-99 Grade 120 and 50% (minimum) Portland Cement ASTM C 150-00, Type I or Type III to conform to ASTM C 595-00 Standard Specification for Blended Hydraulic Cement, Type IS. Submit certification of compliance.

C. Blend of 20% (maximum) Fly Ash conforming to ASTM C 618-00 Class C or F and 80% (minimum) Portland Cement ASTM C 150-00, Type I or Type III by volume. Submit certification of compliance.

2.2 AGGREGATE

A. Fine aggregate shall conform to ASTM C 33-01, “Concrete Aggregates”, except that the fineness modulus shall be not less than 2.1 or more than 3.1 and the graduation shall be as specified herein below:

Sieve	#3	#4	#8	#16	#30	#50	100
Total Percent Passing (By Weight)	100	95-100	80-100	45-95	20-65	8-30	1-8

B. Coarse aggregate shall be crushed stone or gravel and shall conform to ASTM C 33-01, “Concrete Aggregates”. Size of coarse aggregate shall be as specified herein below:

Size #67 (3/4” to #4) Section 4” thick or more:

Sieve	1½”	1”	¾”	2	$^{3}/_{8}$”	#4	#8
Total Percent Passing (By Weight)	100	95-100	90-100	25-60	20-55	0-10	0-5

Size # 7 (2” to #4) Section less than 4” thick:

Sieve	1½”	1”	¾”	2”	$^{3}/_{8}$”	#4	#8
Total Percent Passing (By Weight)	100	100	100	90-100	40-70	0-15	0-5

2.3 WATER

A. Water used in mixing concrete shall be clean and fit to drink.

2.4 ADMIXTURES

A. Air entraining admixture shall conform to the requirements of ASTM C 260-00,

shall be chloride-free, and shall be compatible with the water-reducing and retarding admixture used.

B. Water Reducing Admixture shall be a polymer type admixture and conform to the requirements of ASTM C 494/C 494M-99a Type A, water-reducing admixture, and Type D, water-reducing and retarding admixture; shall not entrain air; and shall be chloride-free. Admixture shall not be Hydroxylated Carboxboxylic or Lignosulfonic Acid type. Submit certification for approval.

C. High Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M-99a, Type F or G, and shall be chloride-free. Admixture shall increase slump of 3-inch range (2 1/2 to 4 inch) job site concrete to 8-inch minimum within five minutes after admixture is introduced and mixed with the concrete.

D. Dispense admixtures separately into the mix by automatic measuring devices.

E. Provide Technical Field Service by a full-time representative of the admixture supplier experienced in the adjustment of concrete mixed for the particular admixture being used.

3.0 Execution

3.1 STATISTICAL MIX DESIGN

A. Standard deviation “Sigma,” used to establish mix design proportions, shall be based on at least 30 consecutive strength tests or the statistical average for two groups totaling 30 or more tests.

B. Tests used to establish standard deviation shall represent concrete produced within the past 12 months using similar materials and shall be for specified test strengths within 1000 PSI of the class of concrete to be proportioned.

C. An independent Engineering Testing Laboratory shall certify the value of standard deviation correct or substantiating tests as indicted above shall be submitted to the Architect for evaluation and approval.

D. Proportion ingredients for each class of concrete by weight with air content equal to 5% and slump equal to 4 inches to produce an average compressive strength at 28 days which exceeds the specified compressive test strength by the greater of the amount indicated below:

1. AVERAGE STRENGTH equals the TEST STRENGTH plus 1.343 “Sigma” plus 500-psi; or,

2. AVERAGE STRENGTH equals TEST STRENGTH plus 2.326 “Sigma”.

3.2 TRIAL BATCH MIX DESIGN

A. Proportion ingredients for each class of concrete by weight with both air content equal to 5% and slump equal to 4 inches to produce on average compressive strength at 28 days, which exceeds the specified compressive test strength by

1200-psi.

3.3 MIX VARIATION

A. All concrete shall be air-entrained. Air content of freshly mixed concrete as determined by the method of ASTM C 173-94 shall be 5-percent except for concrete that is to receive a dry shake surface hardener. A field tolerance of 1 percent plus or minus is acceptable. Concrete that is to receive a dry shake surface hardener shall have an air content from 2 to 3 percent.

B. Standard Slump shall be as follows:

1. Horizontal Members - 4-inch Slump (3-inch to 5-inch Range)
2. Vertical Members - 3-inch Slump (2-1/2-inch to 4-inch Range)

Adjust mix by use of High Range Water Reducing Admixture (Super-plasticizer) for placing to 6-inch Slump (6-inch to 8-inch Range).

C. Water-reducing admixture shall be used in all concrete to reduce the total water requirement per cubic yard of concrete without loss of workability or test strength.

D. Retarding admixture shall be used to retard the setting time when anticipated ambient temperature exceeds 80°F during placing or finishing operation.

E. Minimum cementitious material content shall be not less than 470 pounds cementitious material for 3,000-psi concrete and 520 pounds of cementitious material for 4,000-psi concrete per cubic yard of concrete with 20% maximum fly ash replacement by volume or with 50% slag replacement by weight.

F. Mix Design:

Specified Compressive Strength (psi)	Maximum Water/ Cementitious Ratio W/CM
Class 3000	.59
Class 4000	.54

END OF SECTION 03310

SECTION 041000

MORTAR

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03200 - CONCRETE REINFORCEMENT
B. Section 04150 - MASONRY ACCESSORIES
C. Section 04200 - UNIT MASONRY

1.2 QUALITY ASSURANCE

A. Standards:
1. American Society for Testing and material (ASTM):
a. ASTM C 91 Masonry Cement.
b. ASTM C 144 Aggregate for Masonry Mortar.
c. ASTM C 150 Portland Cement.
d. ASTM C 270 Mortar for Unit Masonry.

B. Use same manufacturer's product throughout project.

C. A job site panel shall be erected as called for in Section 04200 Unit Masonry.

1.3 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. Deliver products to the site in manufacturer's original unopened containers.

B. Store materials in dry watertight sheds with elevated floor.

1.4 SUBMITTALS

A. Submit four copies of manufacturer's certification that materials meet specification requirements.

2.0 PRODUCTS

2.1 MATERIALS

A. All mortar for concrete masonry units shall conform to ASTM C270, Types, and shall consist of 1 part masonry cement conforming to ASTM C 91, and 2 1/4 to 3 parts by volume of clean, graded masonry sand, conforming to ASTM C 144. Color shall be gray.

2.2 MIXES

A. Mortar for Concrete Masonry shall be made in the proportions of (by volume), ½ parts Portland Cement, 1 Part Type II masonry cement, and 4 parts sand for type S Mortar (1500 psi compressive strength).

B. Add most of the water to the machine mixer. Then add the Masonry Cement and 3 shovels of sand, allowing the mixer to work the cement and water into a slurry.

Then add the remainder of the sand. Mortar shall be mixed for five minutes after all materials are in the mixer. Additional water should be added in small amounts until satisfactory workability is attained.

C. No anti-freeze liquids, salts, or substances shall be used in the mortar in an attempt to lower the freezing point.

3.0 EXECUTION

3.1 TIME LIMITS FOR USE

A. Mortar shall be used and placed in final position within 1 ½ hours after mixing when the air temperature is 80□degrees F or higher, and within 3 ½ hours when air temperature is less than 80 degrees. Mortar not used within these time limits shall be discarded.

3.2 RETEMPERING

A. Mortar that has stiffened within the time intervals outlined above may be retempered to restore workability by adding water. Use mortar within 2 hours after initial mixing.

3.3 PROTECTION

A. All unfinished masonry shall be covered with drop cloths as specified in Unit Masonry: Section 04200, to overhang the wall at least 2 feet and weighed down.

3.4 POINTING AND CLEANING

A. Point and fill all holes and cracks in exposed joints with mortar to match surrounding mortar as specified in Unit Masonry: Section 04200.

B. Clean exposed masonry surfaces from top down with a solution as specified in Section 04200; Unit Masonry. Wet walls before applying cleaning solution and protect metal and other work. Clean only a small area at a time. Flush surface with clean water immediately after cleaning each area to avoid staining of the masonry.

END OF SECTION 041000

SECTION 041500

MASONRY

ACCESSORIES

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04100 - MORTAR
B. Section 04200 - UNIT MASONRY
C. Section 07200 - INSULATION
D. Section 07600 - FLASHING AND SHEET METAL

1.2 QUALITY ASSURANCE

A. Standards:

1. 2000 International Building Code.

2. ASTM A153, Class B-2 (Hot dipped galvanized after fabrication).

3. ASTM A116, Class 1, Fed. Spec. QQ-W-461f (Mill galvanized).

4. ASTM A82 (Cold drawn steel wire).

1.3 SUBMITTALS

A. Submit manufacturer's technical data and sample of each type of Masonry Accessories for Engineer's approval.

1.4 PRODUCT HANDLING

A. Masonry accessories shall be stored in a dry place and protected from moisture before placing. Install no masonry reinforcing which has rust, scale or foreign matter on it.

2.0 PRODUCTS

2.1 MATERIALS

A. Masonry wall joint reinforcing shall be Truss Type, cavity and/or single wythe wall type.

1. Interior wall reinforcing shall be extra heavy (side rods 3/16", and cross rods NO. 9) in widths as indicated on Drawings, and mill galvanized(0.040 ounce PSF zinc coating) in accordance with ASTM A 116, Class 1.
2. Exterior wall reinforcing shall be extra heavy (side rods 3/16", and cross rods No. 9) in widths as indicated on Drawings, and hot dip

galvanized after fabricated (1.50 ounce zinc coating) in accordance with ASTM A153, Class B-2. Provide special prefab pieces for corners and

intersections (T's) for walls and partitions.

B. Reinforcing Rods for bond beams, lintels, and walls, not specified elsewhere herein, shall meet all the requirements of ASTM A 615 for Deformed Billet Steel Bars for Concrete Reinforcing, bars shall be Grade 60.

3.0 EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE

A. Unless shown otherwise on the Drawings, masonry wall joint reinforcement shall be placed horizontally at 16" o.c. vertically.

1. Install at all interior and exterior masonry walls.

2. Center reinforcing on wall or as otherwise indicated on the drawings.

3. Prefabricated corners and tee sections shall be used to form continuous reinforcement around corners, and for anchoring abutting walls and partitions.

4. Side rods shall be lapped 6 inches at splices.

5. Discontinue reinforcing 2 inches short of each side of control joints.

6. Joint reinforcing for masonry cavity walls and masonry unit block shall be appropriate width so that reinforcing is totally concealed in joints after block is struck.

B. Masonry wall reinforcing shall be placed as shown on the drawings.

1. Install in interior and exterior walls.

2. Centered in masonry or as otherwise indicated on the drawings.

3. Corner bars shall be provided at all wall intersections.

4. Bars shall be lapped in accordance with the following requirements or unless other indicated on the drawings:

#4 – 24”	#7 – 48”	#10 – 70”
#5 – 26”	#8 – 55”	
#6 – 33”	#9 – 62”	

5. Reinforced cells shall be provided at each side of control joints with reinforcing bars specified on the drawings.

6. Do not cut or otherwise interrupt reinforcing for other trades unless approved in writing by the architect.

END OF SECTION 041500

SECTION

042000

UNIT MASONRY

1.0 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. MORTAR
B. MASONRY ACCESSORIES
C. INSULATION
D. FLASHING AND SHEET METAL
E. SEALANTS
F. Section 08100: METAL DOORS AND FRAMES

1.2 QUALITY ASSURANCE

A. Standards:

1. American Society for Testing and Materials (ASTM)
2. Underwriters Laboratories, Inc. (U.L.)

B. Sample Wall Panel: Before the installation of any masonry materials, erect at the job site a sample wall panel 4' long x 4' high, in a location approved by the Engineer. Panel shall show the proposed colors and color range, texture, all types of coursing to be used in the work, bond, mortar joint, and workmanship of each of the masonry materials and accessories to be incorporated in the job(including insulation). No masonry work shall be done until the Architect has approved the sample panel. The approved panel shall become a standard of comparison for all masonry work built of the materials that the approved panel includes. The panel shall not be altered, moved, or destroyed until the work is complete.

1.3 SUBMITTALS

A. Submit one sample of each type concrete block to the Engineer for approval. Four copies of Test Reports prepared by an approved Testing Laboratory shall accompany samples. Test shall be in accordance with ASTM C 140.

1.4 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. Storage of Materials

1. Concrete Masonry Units shall be stacked on planking. All units shall be delivered to the job site in dry conditions and shall be covered with heavy polyethylene, anchored in place. No block which contains more than 30% moisture shall be laid up in the building walls.

2. Store materials under cover in dry place in a manner to prevent damage or intrusion of foreign matter.
During freezing weather, protect masonry units with tarpaulins.

1.5 ENVIRONMENTAL CONDITIONS

A. Weather Requirements:

1. Lay no masonry when the temperature has dropped below 40 degrees F except by written permission from the Engineer.

2. When masonry work is authorized during temperatures below 40 degrees F, make provisions to heat and maintain the temperature of masonry materials to at least 40 degrees F (but not more than 100 degrees F), and maintaining an air temperature above 40 degrees F on both sides of the masonry for a period of at least 72 hours.

1.6 PROTECTION

A. During erection, keep walls dry by covering during shutdown periods and at the end of each day with drop cloths. Protect partially completed walls (not being worked on) similarly at all times. Covering shall be non-staining, waterproof, and shall overhang at least 2'-0" on each side of the wall, anchored.

B. Protect exposed masonry from staining. Use wall coverings anchored.

2.0 PRODUCTS

2.1 MATERIALS

A. Regular Concrete Masonry Units: Hollow Load-Bearing & Non Load-Bearing Concrete Block shall comply with ASTM C 129, Grade N, Type 1 (Moisture Controlled) and shall be Lightweight (weighing less than 105 lb/cu ft.) and of sizes indicated on the Drawings. Minimum compressive strength shall be no less than 2050 p.s.i.

B. Masonry Cleaning Agent shall be SURE-KLEEN VANATROL CLEANER as manufactured by the Process Solvent Co., Inc.

2.2 GROUT

A. Ingredients:
1. Portland cement: Comply with ASTM C150, Type I.
2. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter.
3. Admixtures: Do not use admixtures unless specifically approved in advance by the Architect.
4. Water: Provide water free from injurious amounts of acids, alkalis, and organic materials.

3.0 EXECUTION

3.1 INSTALLATION

A. Coordination: Do not enclose or cover up Mechanical or Electrical specified in other sections until such work has been inspected and approved by the Engineer.

B. General Requirements:

1. Lay regular concrete block with full mortar coverage on horizontal and vertical face shells, except in starting course on footings and solid foundation walls and around cells that are to be reinforced or filled with concrete or grout.

2. Provide continuous vertical expansion and control joints in concrete block and partitions at locations as indicated on the Drawings. Form joints as detailed on the Drawings. Joint reinforcement shall not continue across control joints unless indicated on the Drawings.

3. Where cast-in-place lintels are used in concrete block they shall be formed in place with special shaped lintel block as specified herein. Lintels shall be reinforced as detailed on the Drawings and filled with 3000 psi grout. Lintels shall have a minimum 8 inch bearing at each end. Provide temporary support under each lintel.

4. Where electrical conduit, outlet, and switch boxes occur, grind and cut units before building-in services. Build into block work all accessories as shown on the Drawings or as specified herein. Grouting of ties and anchors into hardened masonry will <u>not</u> be permitted.

5. Install reinforcement as specified in “Masonry Accessories,” Section 04150. Partitions that abut exterior walls, and other partitions, except when control joints occur as such locations, shall be bonded in or be anchored there to every 16 inches in height unless shown otherwise on the Drawings. Additionally, corner bars shall be provided at all wall intersections.

6. The Contractor shall locate openings in masonry work to course out with block coursing, unless such openings are detailed otherwise on the drawings. Avoid cutting and patching.

7. Thru-wall flashings as detailed on the Drawings or as specified herein, shall extend to within 1/2 inch from the exterior face of the wall. Splice flashing by lapping a minimum of 12 inches and bedding lap into non-staining mastic.

8. Straw or sand shall be placed on the ground as block is laid up to protect the block from red clay and stains.

C. Building in:

1. Build work of other trades into masonry work (including anchors, wall

plugs, and accessories) as work progresses. Space and align built-in parts. Exercise care not to displace other materials from position. Do not cut or otherwise displace reinforcing unless approved in writing by the Architect.

2. Fill spaces around built-in items with mortar. Fill metal door frames in masonry walls with mortar as wall is laid.

3. When flashing is laid on or against masonry, the surface of the masonry shall be smooth and free from projections which might puncture the flashing material.

D. Anchoring to Work of Other Trades:

1. Coordinate with other trades for placement of anchors for securing masonry to structural members.

E. Cutting and Patching:

1. Where cut edges of masonry units will be exposed in the finished wall, cut units with an abrasive power saw.

2. Where cutting and patching of finish masonry accommodates work of other trades, perform work in a manner that will not damage or mar appearance of adjoining masonry. Cutting and patching shall be performed by masonry mechanics.

F. Joining of Work:

1. Where fresh masonry is joined to masonry that is partially set or totally set, clean and wet exposed surfaces of the set masonry. Remove loose brick and mortar.

2. To “stop off” a horizontal run of masonry, rake back one half block length in each course. Stop grout 8" back of rake. Toothing will not be permitted.

G. Joint Treatment:

1. Lay block with joints tooled as specified.

2. Joints in masonry which will be in contact with earth shall be struck flush, and, when partially set, shall be tooled concave.

3. Joints to receive caulking shall be raked over 3/4" and left ready for caulking.

4. Tool joints with a steel tool with pressure to squeeze mortar into joints.

H. Reinforcement:

1. Provide reinforcement as shown on the Drawings, fully embedded in grout and not in mortar or mortar joints.

2. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

3.2 POINTING

A. Point holes in exposed masonry (except weep holes.)

B. Cut out defective joints and joints not in compliance with approved sample panel. Repoint with mortar and tool.

C. Pointed work shall match adjoining joints.

3.3 GROUTING

A. Prior to installing grout, clean cells to be grouted in accordance with Section 3.4.

B. Perform grouting in strict accordance with the provisions of the governing building code.
1. Solidly fill vertical cells containing reinforcement.
2. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.

3.4 CLEANING

A. Exposed masonry shall be cleaned with clean water as the work progresses.

B. The Contractor shall prevent mortar from collecting on floor slabs and adjacent materials. At the end of each day, all mortar droppings shall be removed from floor slabs or other work. Any work which is stained or damaged as a result of masonry work shall be replaced.

C. Methods and materials used to clean masonry shall be approved by manufacturer of masonry unit to be cleaned.

D. Before applying any cleaning agent to entire wall, apply agent to a sample wall area approximately 40 square feet. Apply in a location approved by the Engineer. After sample area is approved by the Engineer, clean remaining wall area with same cleaning materials and methods used on sample area.

E. Clean masonry from top down.

F. First, clean masonry surface with stiff brushes and clear water.

G. Using soft fibered masonry washing brush, apply the prepared (diluted) cleaning solution.

H. Allow cleaning solution to remain on the wall for a period of 1 to 3 minutes, depending on drying conditions. Scrape off excess mortar and reapply cleaning solution.

I. Rinse with fresh water removing all cleaning compound, free sand, and mortar.

J. Where efflorescence does not appear and where stiff brushes and water do not suffice, clean masonry surfaces with acid solution. Wet masonry surfaces with clear water. Scrub down with a solution of not more than 1 part hydrochloric (muriatic) acid to 9 parts water. Rinse surfaces immediately with clear water.

K. If masonry is cleaned with an acid solution, protect window sash, metal lintels, and corrodible parts.

L. Provide clean outs at the bottom of each vertically reinforced cell. Clean excess mortar, dirt, and other foreign debris from inside cleanout and plughole with face shell prior to grouting cell.

END OF SECTION - 042000

SECTION 04 26 13 - MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Clay face brick.

B. Products Installed but Not Furnished under This Section:

1. Steel lintels in masonry veneer.
2. Steel shelf angles for supporting masonry veneer.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type and color of [**brick**] [**and**] [**colored mortar**].

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product.

1.4 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for typical exterior wall.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

2.2 BRICK

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216 or hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
1. Grade SW.
2. Type FBX.
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67.
4. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
5. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet (3 m) or shall have a history of successful use in Project's area.
6. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
7. Color and Texture: As selected by Architect.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

F. Aggregate for Mortar: ASTM C144.

1. White-Mortar Aggregates: Natural white sand or crushed white stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete bricks containing integral water repellent from same manufacturer.

I. Water: Potable.

2.4 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized-steel wire.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized-steel wire.

2.5 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: **7-oz./sq. ft. (2-kg/sq. m)** copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, 0.040 inch (1.02 mm) thick.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

B. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

3. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1.
2. Configuration: Provide one of the following:

   a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
   b. Strips, not less than **1-1/2 inches (38 mm)** thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
   c. Sheets or strips, full depth of cavity and installed to full height of cavity.

2.7 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.8 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Use Type N unless another type is indicated.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

B. Provide not less than 2 inches (50 mm**)** of airspace between back of masonry veneer and face of sheathing.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 2 inches (50 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.7 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.

D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

3.9 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 26 13

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SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1. SUMMARY
1

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Shelf angles.
3. Metal ladders.
4. Miscellaneous steel trim.
5. Downspout guards.
6. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicatedto be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete.

1. ACTION SUBMITTALS
2

A. Product Data: For the following:
1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Manufactured metal ladders.
5. Downspout guards.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, anddetails of metal fabrications and their connections. Show anchorage and accessory items.

C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by thequalified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000"Quality Requirements," to design ladders.

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2.2 METALS

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 FASTENERS

A. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

B. Post-Installed Anchors:

1. Material for Interior Locations: Carbon-steel components zinc plated to comply withASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal andcompatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal- weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 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 otherwiseimpairing work.

D. Form exposed work 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 corrosionresistance 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 or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk)fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water.Provide weep holes where water may accumulate.

H. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. 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.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing.Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise

indicated.

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1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open jointapproximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry andconcrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails **18 inches (457 mm)** apart unless otherwise indicated.
2. Siderails: Continuous, **1/2-by-2-1/2-inch (12.7-by-64-mm)** steel flat bars, with easededges.
3. Rungs: **1-inch- (25-mm-) diameter**, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung.
6. Galvanize and prime exterior ladders, including brackets.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed fieldsplices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonryconstruction.

C. Galvanize exterior miscellaneous steel trim.

2.10 DOWNSPOUT GUARDS

A. Fabricate **downspout** guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch

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(50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchorbolts.

B. Galvanize and prime steel downspout guards.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unitwhere indicated.

B. Galvanize and prime loose steel lintels located in exterior walls.

2.13 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 no fewer than twointegrally welded steel strap anchors for embedding in concrete.

2.14 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steeland iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." requirements indicated below:

.

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "CommercialBlast Cleaning."
3. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and UncoatedGalvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metalfabrications. 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 notto 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 corrosionresistance 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 screws, wood screws, andother connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. 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 overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with expansion anchors.

D. 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.

3.3 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improvebond 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 shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paintuncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repairgalvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

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SECTION 06 10 53 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood grounds.
3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. 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. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent thickness or less.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

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 that 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 rough carpentry unless otherwise indicated. Items indicated on Drawings, and the following:
1. Wood blocking, furring and similar concealed members in contact with masonry or concrete.
2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 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. Furring.
4. Grounds.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber 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. 3 grade; SPIB.
2. Eastern softwoods; No.2 Common grade; NeLMA.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged , fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

D. Securely attach rough 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 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.

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.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

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SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Parapet sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
1. Type and Thickness: **Type X, 5/8 inch (15.9 mm)** thick.

2.2 PARAPET SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
1. Type and Thickness: **Type X, 5/8 inch (15.9 mm)** thick.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

B. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate wall and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

1. Wall Sheathing:
   a. Screw to cold-formed metal framing.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1.
   2. Plastic-laminate cabinets.
   3. Plastic-laminate filler panels.
   4. Solid-surfacing-quartz countertops, vanities and sills

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: For cabinet hardware and accessories finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:
   1.
   2. Plastic-laminates, for each type, color, pattern, and surface finish.
   3. Solid-surfacing materials.

D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.

B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

2.2 MATERIALS

A. Wood Products:
   1.
   2. Hardboard: AHA A135.4.
   3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
   4. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

C. Solid-Surfacing Material: Homogeneous solid sheets of quartz filled plastic resin complying with ISSFA-2
   1. Basis of Design: Subject to compliance with requirements; Zodiac by E. I. du Pont de Nemours and Company; color group C, or one of the following:
      a.
      b. Cambria.
      c. CeasarStone.
      d. Silestone by Cosentino.
      e. Verona Marble Co.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use Exterior Type or Interior Type A. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Kiln-dry material after treatment.

B. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

C. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Drawer Slides: BHMA A156.9, B05091.
   1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted and extending under bottom edge of drawer; type; zinc-plated steel with polymer rollers.

F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1.
   1. Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, fire-retardant-treated, kiln-dried to less than 15 percent moisture content.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

C. Adhesive: Approved by countertop manufacturer.

2.6 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
   1. Interior Woodwork Grade: Custom.
   2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.

B. Plastic-Laminate Cabinets:
   1. AWI Type of Cabinet Construction: Flush overlay.
   2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
      a. Horizontal Surfaces Other Than Tops: Grade HGS.
      b. Vertical Surfaces: Grade VGS.
      c. Edges: Grade HGS.

3. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade CLS.
4. Drawer Sides and Backs: Solid-hardwood lumber.
5. Drawer Bottoms: Hardwood plywood.
6. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of solid colors, matte finish.
7. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim as required with concealed shims.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.
1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.

G. Countertops: Anchor securely supports underside of top. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

END OF SECTION 06 40 23

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Polyisocyanurate foam-plastic board.
3. Glass-fiber blanket.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards."

B. Extruded Polystyrene Board, Type X: ASTM C578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.
1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

B. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. 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.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

END OF SECTION 07 21 00

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07 26 00 - UNDER-SLAB VAPOR RETARDER

PART 1 – GENERAL

1.1 SUMMARY

A. Products Supplied Under This Section
1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. RELATED SECTIONS
1. Section 03300 Cast-in-place Structural Concrete

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM E 1745-11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
2. ASTM E1643- 11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. American Concrete Institute (ACI)
1. ACI 302.1R-06 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.

1.3 SUBMITTALS

A. Quality Control / Assurance
1. Summary of test results per paragraph 9.3 of ASTM E1745.
2. Manufacturer's samples and literature.
3. Manufacturer's installation instructions for placement, seaming, penetration repair, and perimeter seal per ASTM E1643.
4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor Retarder: When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision.

1. Vapor Retarder membrane must have the following properties.

A. Permeance rating Per ASTM E 96 or ASTM F 1249
Must meet permeance requirements for both new material and after ASTM E-1745 mandatory conditioning tests (ASTM E 154; Sections 8, 11, 12, 13):

a. New material Less than 0.01 perms (gr/ft^2/hr/in-Hg)
b. After conditioning Less than 0.01 perms (gr/ft^2/hr/in-Hg)

B. Vapor Retarder ASTM E 1745 Meets or exceeds Class A
C. Minimum thickness ACI 302.1R-06 10 mils
D. Manufactured from prime virgin resins

E. Woven materials not acceptable
F. Basis of Design: Stego Wrap Class A Vapor Retarder (10-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.

2.2 ACCESSORIES

A. Seam Tape
1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC, (887) 464-7834 www.stegoindustries.com.
2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
3. StegoTack Tape (double sided) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

D. Pipe Boots
1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Install vapor barrier in accordance ASTM E1643.
1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor retarder to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor retarder. At the point of termination, seal vapor retarder to the foundation wall, grade beam or slab itself. Seal vapor retarder to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
3. Overlap joints 6 inches and seal with manufacturer's seam tape.
4. Apply seam tape/Crete Claw to a clean and dry vapor retarder.
5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. Avoid the use of non-permanent stakes driven through vapor retarder.
7. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
8. Repair damaged areas with vapor retarder material of similar (or better) permeance, puncture and tensile.

END OF SECTION 07 26 00

SECTION 07 27 20 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Vapor-permeable, fluid-applied air barriers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For air-barrier assemblies.

   1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

C. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum **0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa)**, when tested according to ASTM E2357.

2.3 VAPOR PERMEABLE MEMBRANE AIR-BARRIER

1. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.
    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
        1) Synthetic Polymer Membrane:
            a) Basis-of-Design: Senergy Senershield-R
            b) Carlisle Coatings & Waterproofing Inc.; Barritech VP.
            c) Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
            d) Henry Company; [Air-Bloc 31] [or] [Air-Bloc 33].
            e) Prosoco: R-Guard MVP
        2) Physical and Performance Properties:
            a) Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
            b) Vapor Permeance: Minimum 1 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M.

c) Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
d) Retain "UV Resistance" Subparagraph below if required. Manufacturers generally specify covering bituminous air barriers within 30 days except for products with modified UV resistance; consult manufacturers for recommendations and product availability.
e) UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Bridge expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.2 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

D. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

E. Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Permeable Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.

F. Do not cover air barrier until it has been tested and inspected by testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests: As determined by testing agency from among the following tests:

1. Air-barrier dry film thickness.
2. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage.
3. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783 or ASTM E2357.
4. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each **600 sq. ft. (56 sq. m)** of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

E. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Remove masking materials after installation.

END OF SECTION 07 27 20

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SECTION 074113 - STANDING-SEAM METAL ROOF

PANELSPART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose workinterfaces with or affects metal panels, including installers of roof accessories and roof- mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck, purlins and steel framing during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replacecomponents of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agreesto repair finish or replace metal panels that show evidence of deterioration of factory- applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agreesto repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa)

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa)

D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations 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.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced; a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Berridge Manufacturing Co. **(Basis of Design: Aluminum Panels (.032) Double– LockZee-Lock Panel)**
2. Englert, Inc.
3. Petersen Aluminum Corp.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant,

polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-

paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C);ASTM D 1970.

3. Carlisle Residential; a division of Carlisle Construction Materials
4. Grace Construction Products
5. Henry Company
6. Kirsch Building Products
7. Metal-Fab Manufacturing
8. Owens Corning

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steelsheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from materialrecommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicatedor necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels; roof fascia and rake trim.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch (1.2-mm) nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box andintegral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

G. Panel Fasteners: Self-tapping screws designed to withstand design loads.

H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. 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.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight;and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full lengthof panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that providea weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, andtool marks and that are true to line and levels indicated, with exposed edges folded back toform hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams andseal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealantand to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are notallowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metalpanel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying astrippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other

components are acceptable if

they are within the range of approved Samples and are assembled or installed to minimizecontrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposedmetal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing orbacking substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edgesnot less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller.Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes,and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splicesand end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to theexterior; use aluminum or galvanized-steel fasteners for surfaces exposed to theinterior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommendedin writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installationinstructions.

3. Snap Joint: Nest standing seams and fasten together by interlocking and completelyengaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer toolso clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panelswatertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, andaccessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Clipless Metal Panel Installation: Fasten metal panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, andseams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Spacemovement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used orwould not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant(concealed within joints).

I. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standardfasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

J. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspoutssecurely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

K. Roof Curbs: Install flashing around bases where they meet metal roof panels.

L. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offsetof adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine complianceof replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed,unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Manufactured reglets.
   2. Formed roof drainage system.
   3. Formed roof flashing and trim.

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as specified in this and other sections, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak or loosen and shall remain watertight.

1.3 SUBMITTALS

A. Product Data: For each product indicated.
B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim. Submittal shall include verification of downspout sizes with drainage calculations.
C. Samples: For each type of sheet metal flashing and trim.
D. Provide manufacturer’s documentation indicating separate percentages, by weight, of post-consumer and pre-consumer recycled content. Also include material costs, excluding cost of installation.
E. Provide manufacturer’s documentation indicating location of manufacturing facility and location where the base materials were extracted, mined, quarried, harvested, etc. Include address and distance to the project site for both manufacture and harvest. Also include material costs, excluding cost of installation.

1.4 ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
B. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical roof eave fascia, approximately 48 inches (1200 mm) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
C. Preinstallation Conference: Conduct conference at Project site.

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PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
   1. High-Performance Organic Finish: Three-coat, thermocured system containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
      a. Color: As selected by Architect from manufacturer's full range.
   2. Provide Pretreatment: All aluminum shall be pretreated and dipped prior to the Kynar finish.
B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, No. 4 finish.

2.2 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.
B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
   1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).
C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
   1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
   3. Blind Fasteners: High-strength stainless-steel rivets.
D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound.
H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.3 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 factory-mitered and -welded corners and junctions.
   1. General: Reglets shall be compatible with counterflashing and roofing material.
   2. Manufacturers:
      a. Fry Reglet Corporation.
      b. Hickman, W. P. Company.
      c. O' Keefe's Inc.
   3. Material:
      a. Stainless steel, Type 304, 0.020 inch thick
   4. Type:

a. Concrete: Manufactured channel with temporary closure tape to keep reglet free of concrete materials, fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
   1) Product: CW (O'Keefe Inc); CO (Fry Reglet Corp.)
b. Masonry: Manufactured reglet with offset top flange for embedment in masonry mortar joint.
   1) Product: MI (O'Keefe Inc); MA (Fry Reglet Corp.)
c. Stucco/Siding: Manufactured reglet installed prior to lathing. Use wind clips as required to comply with the Florida Building Code.
   1) Product: SS (O'Keefe Inc); ST or STX (Fry Reglet Corp.)
d. Existing/Surface Mounted: Manufactured surface applied reglet with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   1) Product: EN (O'Keefe Inc); SM (Fry Reglet Corp.)

2.4 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, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
B. Fabricate 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.
   1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with elastomeric sealant concealed within joints.
E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.5 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: Wire ball downspout strainer.
   2. Fabricate from the following material:
      a. Aluminum: Minimum 0.040 inch (1.0 mm) thick.
B. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Fabricate downspouts from the following material:
      a. Aluminum: Minimum 0.024 inch (0.6 mm) thick.

2.6 ROOF SHEET METAL FABRICATIONS

A. Base and Step Flashing: Fabricate from the following material:
   1. Aluminum: Minimum 0.040 inch (1.0 mm) thick.
B. Counterflashing and Flashing Receivers: Fabricate from the following material:
   1. Aluminum: Minimum 0.0320 inch (0.8 mm) thick.
C. Drip Edges: Fabricate from the following material:
   1. Aluminum: Minimum 0.0320 inch (0.8 mm) thick.

2.7 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. Stainless Steel: 0.016 inch (0.40 mm) thick.

B. Opening Flashings in Wall Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

PART 3 - EXECUTION

3.1 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. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. 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 fabricator or manufacturers of dissimilar metals.
C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
E. 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.
   1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type 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 elastomeric sealant concealed within joints.
G. Fasteners: Use stainless steel fasteners of sizes that will penetrate substrate not less than 1- 1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for screws.

H. Seal joints as shown and as required for watertight construction.
   1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edgesof sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned surface would show in finished Work.
   1. Do not solder aluminum sheet.

3.2 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 elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets and straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.24 m) apart. Install expansion joint caps.
   2. Slope gutters not less than 1/8-inch per foot.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

D. Splash Pans: Install concrete splash pans at every downspout.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements 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.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.
   1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at spacing required to accommodate wind speeds and the Florida Building Code.

C. Copings: Refer to Division 07 Section “Roof Specialties.”

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.

E. Metal Base Flashing: Locate over membrane base flashing and secure with continuous cleat form compression seal. Fasten cleat at maximum 4 inches on center. Extend bottom flange of metal base flashing over roofing assembly and hold in place with insulation. Fill top well of cleatserving as metal base flashing termination bar with joint sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as required to provide weather and watertight roof assembly. All piping penetrations shall be painted to match roofing.

G. Reglets: Shall be fasten, a maximum of 12-inches o.c., unless otherwise recommended per manufacturers written instructions.
   1. Insert counterflashing into reglet to form tight fit. Secure in place with wedges at maximum of 12-inches o.c. Seal flashing into reglets with sealant.

END OF SECTION 07 62 00

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SECTION 07 84 13 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

1.4 QUALITY ASSURANCE

A. Installation Responsibility: Assign installation of through-penetration firestop systems in Project to a single qualified installer.

B. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

C. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

E. GREEN GLOBE Submittals:
1. Product Data: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content. Provide manufacturer's product data and material safety data sheets (MSDS) for adhesives and sealants used on the interior of the building including printed statement of VOC content in g/L.

F. Laboratory Test Reports: For penetration firestopping selants and sealant primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems that are produced by one of the following manufacturers:

1. A/D Fire Protection Systems Inc.
2. Grace, W. R. & Co. - Conn.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.

6. NUCO Inc.
7. RectorSeal Corporation (The).
8. Specified Technologies Inc.
9. 3M; Fire Protection Products Division.
10. Tremco; Sealant/Weatherproofing Division.
11. USG Corporation.

2.2 FIRESTOPPING

A. Compatibility: 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. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

END OF SECTION 07 84 13

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Polysulfide joint sealants.
4. Latex joint sealants.
5. Solvent-release-curing joint sealants.
6. Preformed joint sealants.
7. Acoustical joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. GREEN GLOBE Submittal:

1. Product Data: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind 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.

E. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Field-Adhesion Test Reports: For each sealant application tested.

F. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from 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. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

PART 2 - PRODUCTS

2.1 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 joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where 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.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790 NS Parking Structure Sealant.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; Bondaflex Sil 290 Bondaflex Sil 728 NS.
d. Pecora Corporation; 301 NS 311 NS 890 890FTS.
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; Spectrem 1 Spectrem 800.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Omniseal 50.
b. Dow Corning Corporation; 756 SMS 791 795 995.
c. GE Advanced Materials - Silicones; SilGlaze II SCS2800 SilPruf NB SCS9000 SilPruf SCS2000 UltraPruf II SCS2900.
d. May National Associates, Inc.; Bondaflex Sil 295.
e. Pecora Corporation; 864 895 898.
f. Polymeric Systems, Inc.; PSI-641.
g. Sika Corporation, Construction Products Division; SikaSil-C995.
h. Tremco Incorporated; Spectrem 2 Spectrem 3.

C. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 799.
b. GE Advanced Materials - Silicones; UltraGlaze SSG4000 UltraGlaze SSG4000AC.
c. May National Associates, Inc.; Bondaflex Sil 200 GPN Bondaflex Sil 201 FC.
d. Polymeric Systems, Inc.; PSI-631.
e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
f. Tremco Incorporated; Proglaze SSG Tremsil 600.

D. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; Chem-Calk 1200.
b. Dow Corning Corporation; 999-A.
c. GE Advanced Materials - Silicones; Contractors SCS1000 Construction SCS1200.
d. May National Associates, Inc.; Sil 100 GC Sil 100 GP Sil 100 WF.
e. Pecora Corporation; 860.
f. Polymeric Systems, Inc.; PSI-601.
g. Schnee-Morehead, Inc.; SM5732 Polyglaze.
h. Tremco Incorporated; Proglaze Tremsil 200.

E. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790 NS Parking Structure Sealant.
b. May National Associates, Inc.; Bondaflex Sil 728 NS.
c. Pecora Corporation; 301 NS 311 NS.
d. Tremco Incorporated; Spectrem 800.

F. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 890-SL SL Parking Structure Sealant.
b. May National Associates, Inc.; Bondaflex Sil 728 SG Sil 728 SL.
c. Pecora Corporation; 300 SL 310 SL.
d. Tremco Incorporated; Spectrem 900 SL.

G. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Spectrem 4TS.

H. Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; FC Parking Structure Sealant.
b. May National Associates, Inc.; Bondaflex Sil 728 RCS.

I. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; 898.

J. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Omniplus.
b. Dow Corning Corporation; 786 Mildew Resistant.
c. GE Advanced Materials - Silicones; Sanitary SCS1700.
d. May National Associates, Inc.; Bondaflex Sil 100 WF.
e. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Tremco Incorporated; Vulkem 921 Dymonic FC.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pacific Polymers International, Inc.; Elasto-Thane 230 LM Type II.
b. Polymeric Systems, Inc.; PSI-901.

C. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP1 Sonalastic TX1 Sonolastic Ultra.
b. Bostik, Inc.; Chem-Calk 900 915 916 Textured.
c. May National Associates, Inc.; Bondaflex PUR 25 Bondaflex PUR 25 Textured Bondaflex PUR 40 FC.
d. Pacific Polymers International, Inc.; Elasto-Thane 230 Type II.
e. Pecora Corporation; Dynatrol I-XL.
f. Polymeric Systems, Inc.; Flexiprene 1000.
g. Schnee-Morehead, Inc.; Permathane SM7100 Permathane SM7108 Permathane SM7110.
h. Sika Corporation, Construction Products Division; Sikaflex - 1a.
i. Tremco Incorporated; Dymonic Vulkem 116.

D. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP1 Sonolastic Ultra.
b. May National Associates, Inc.; Bondaflex PUR 40 FC.
c. Pacific Polymers International, Inc.; Elasto-Thane 230 Type II.
d. Sika Corporation, Construction Products Division; Sikaflex - 1a.
e. Tremco Incorporated; Vulkem 116.

E. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic SL 1.
b. Bostik, Inc.; Chem-Calk 950.
c. May National Associates, Inc.; Bondaflex PUR 35 SL.
d. Pecora Corporation; Urexpan NR-201.
e. Polymeric Systems, Inc.; Flexiprene 952.
f. Schnee-Morehead, Inc.; Permathane SM7101.
g. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
h. Tremco Incorporated; Vulkem 45.

F. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240 Dymeric 240 FC.

G. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP 2.
b. Bostik, Inc.; Chem-Calk 500.
c. May National Associates, Inc.; Bondaflex PUR 2 NS.
d. Pacific Polymers International, Inc.; Elasto-Thane 227 High Shore Type II Elasto-Thane 227 R Type II Elasto-Thane 227 Type II.
e. Pecora Corporation; Dynatred.
f. Sika Corporation, Construction Products Division; Sikaflex - 2c NS Sikaflex - 2c EZ Mix.
g. Tremco Incorporated; Vulkem 227.

H. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Polymeric Systems, Inc.; PSI-270.
b. Tremco Incorporated; Dymeric 240 FC.

I. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP 2.
b. LymTal International, Inc.; Iso-Flex 885 SG.
c. May National Associates, Inc.; Bondaflex PUR 2 NS.
d. Pacific Polymers International, Inc.; Elasto-Thane 227 High Shore Type II Elasto-Thane 227 Type II.
e. Pecora Corporation; Dynatred.
f. Sika Corporation, Construction Products Division; Sikaflex - 2c NS Sikaflex - 2c EZ Mix.
g. Tremco Incorporated; Vulkem 227.

J. Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP1.
b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
c. Tremco Incorporated; Vulkem 116.

K. Immersible, Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
b. Tremco Incorporated; Vulkem 45.

L. Immersible Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic NP 2.
b. LymTal International, Inc.; Iso-Flex 885 SG.
c. May National Associates, Inc.; Bondaflex PUR 2 NS.
d. Pecora Corporation; Dynatred.
e. Tremco Incorporated; Vulkem 227.

M. Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. LymTal International, Inc.; Iso-Flex 880 GB.
    b. May National Associates, Inc.; Bondaflex PUR 2 SL.
    c. Tremco Incorporated; Vulkem 245.

2.4 POLYSULFIDE JOINT SEALANTS

A. Single-Component, Nonsag, Polysulfide Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pacific Polymers International, Inc.; Elastoseal 230 Type I.
    b. W. R. Meadows, Inc.; Deck-O-Seal One Step.

B. Multicomponent, Nonsag, Polysulfide Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems; Sonolastic Polysulfide Sealant.
    b. Pacific Polymers International, Inc.; Elasto-Seal 227 Type II.
    c. Pecora Corporation; Synthacalk GC-2+.
    d. W. R. Meadows, Inc.; Deck-O-Seal Gun Grade.

C. Multicomponent, Nonsag, Traffic-Grade, Polysulfide Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems; Sonolastic Polysulfide Sealant.
    b. Pecora Corporation; Synthacalk GC-2+.

D. Multicomponent, Pourable, Traffic-Grade, Polysulfide Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pacific Polymers International, Inc.; Elastoseal 227 Type I.
    b. W. R. Meadows, Inc.; Deck-O-Seal 125 Deck-O-Seal 150.

E. Immersible, Multicomponent Nonsag, Traffic-Grade, Polysulfide Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T and Use I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pecora Corporation; Synthacalk GC-2+.

2.5 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems; Sonolac.
    b. Bostik, Inc.; Chem-Calk 600.
    c. May National Associates, Inc.; Bondaflex 600 Bondaflex Sil-A 700.
    d. Pecora Corporation; AC-20+.
    e. Schnee-Morehead, Inc.; SM 8200.
    f. Tremco Incorporated; Tremflex 834.

2.6 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic-Based Joint Sealant: ASTM C 1311.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Schnee-Morehead, Inc.; Acryl-R Acrylic Sealant.
    b. Tremco Incorporated; Mono 555.

B. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bostik, Inc.; Chem-Calk 300.
    b. Pecora Corporation; BC-158.
    c. Tremco Incorporated; Tremco Butyl Sealant.

2.7 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. GE Advanced Materials - Silicones; UltraSpan US1100.
c. May National Associates, Inc.; Bondaflex Silbridge 300.
d. Pecora Corporation; Sil-Span.
e. Sealex, Inc.; ImmerSeal.

B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Specialty Chemicals; Polytite Standard.
b. EMSEAL Joint Systems, Ltd.; Emseal 25V.
c. Sandell Manufacturing Co., Inc.; Polyseal.
d. Schul International, Inc.; Sealtite Sealtite 50N.
e. Willseal USA, LLC; Willseal 150 Willseal 250.

2.8 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; AC-20 FTR AIS-919.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2.9 JOINT SEALANT BACKING

A. General: Provide sealant backings of material 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) Type O (open-cell material) Type 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.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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, 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.
d. Exterior stucco finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate 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. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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. Install sealant backings of kind 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.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

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 in subparagraphs 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. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 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.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Tile control and expansion joints.
   c. Joints between different materials listed above.
   d. Other joints as indicated.
2. Urethane Joint Sealant: Single component, nonsag, traffic grade.
3. Preformed Joint Sealant: Preformed foam sealant.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints in dimension stone cladding.
   e. Joints in exterior stucco finish systems.
   f. Joints between different materials listed above.
   g. Perimeter joints between materials listed above and frames of doors windows and louvers.
   h. Control and expansion joints in ceilings and other overhead surfaces.

2. Urethane Joint Sealant: Single component, nonsag, Class 100/50.
3. Preformed Joint Sealant: Preformed silicone Preformed foam.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
   c. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
   e. Joints on underside of plant-precast structural concrete beams and planks.
   f. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.

2. Joint Sealant: Acrylic based joint sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

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SECTION 08 11 13 - 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:

1. Interior steel doors and frames.
2. Exterior steel doors and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
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.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than **0.50 deg Btu/F x h x sq. ft. (2.84 W/K x sq. m)** when tested according toASTM C518.

2.2 INTERIOR STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches (44.5 mm).
   c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
   d. Edge Construction: Model 1, Full Flush.
   e. Core: Manufacturer's standard.

2. Frames:

   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
   b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Full profile welded.

2.3 EXTERIOR STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches (44.5 mm).
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum **A60 (ZF180)** coating.
   d. Edge Construction: Model 2, Seamless.
   e. Edge Bevel: [**Bevel lock and hinge edges 1/8 inch in 2 inches (3.2 mm in 51 mm)**] Provide manufacturer's standard beveled or square edges.

f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Manufacturer's standard.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum **A60 (ZF180)** coating.
b. Construction: Full profile welded.

2.4 BORROWED LITES

A. Fabricate of metallic-coated steel sheet, minimum thickness of [0.053 inch (1.3 mm)] [0.042 inch (1.0 mm)].

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. 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 hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation 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 (51 mm) o.c. from each corner.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Hollow-Metal Frames: 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 without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.
2. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
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. Installation Tolerances: Adjust hollow-metal frames 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.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Smoke-Control Doors: Install doors according to NFPA 105.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

A. 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.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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SECTION 08 21 00 - WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide wood doors.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature, specifications, installation instructions, warranty form and other data required to indicate compliance with specified requirements.

B. Shop Drawings:

1. Submit door schedule indicating opening identifying number, door type, grade, size thickness, swing, label requirements and undercuts.
2. Include door elevations indicating type of construction conditions at cutouts for vision panels and louvers.
3. Detail full size molding sections.
4. Indicate pre-fitting and pre-machining requirements including hardware locations.
5. Use same reference number for openings and details as Contract Drawings.

C. Samples: Submit minimum 8" x 10" samples showing specified wood veneer and factory finish applied to actual door face material.

D. Certificates: Submit to indicate compliance with specified fabrication and test requirements signed by authorized representative of door manufacturer.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Manufacturer Qualifications:

1. All products covered under this Section shall be produced by a single manufacturer unless other specified.
2. Manufacturer shall submit evidence of having not less than ten (10) years successful production of this product.

C. Source Quality Control: AWI Quality Standards of Architectural Woodwork Institute, Section 01300, WDMA I.S.1A-04 Architectural Wood Flush Door Standard.

D. To the greatest extent possible, obtain all doors and frames from one manufacturer. Wood Door Supplier shall maintain an office and warehouse within 50 miles from the job site to properly maintain and service the project during and after construction is complete.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect during transit, storage and handling to prevent damage, soiling and deterioration.

B. Comply with manufacturer's instructions and with "On-Site-Care" requirements of AWI pamphlet "Care and Finishing of Wood Doors".

C. Deliver components in manufacturer's original unopened protective covering or container, clearly marked with manufacturer's name, brand name and identifying number on covering.

D. Storage:

1. Store in clean, dry, well ventilated area protected from sunlight.
2. Avoid extreme heat, cold, dryness or humidity.
3. The relative humidity in the storage area shall not be less than 10% nor greater than 50%.
4. Store flat over level surface above floor on wood blocking.
5. Under bottom door and over top of stack, furnish plywood or corrugated cardboard for protection.

E. Handling: Do not drag doors across one another or across other surfaces.

1.05 WARRANTY

A. Submit written warranty on manufacturer's standard form signed by official of door manufacturer agreeing to repair or replace defective doors which have:

1. Delaminated in any degree.
2. Warp or twist of 1/4" or more in plane of door face.
3. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100" in any 1" span.
4. When hanging doors, do not subject them to extremes of heat and/or humidity conditions. Relative humidity shall not be less than 30% nor more than 50%.

B. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of the defective doors.

C. Warranty shall be in effect for life of original installation (interior use).

1.06 ACCEPTABLE MANUFACTURERS

A. A specific product or material manufactured by any of the following listed

manufacturers are "acceptable" (not "approved") only if the specific product or material can evidence exact compliance with the Contract Documents.

1. VT Industries
   1000 Industrial Park
   P.O. Box 490
   Holstein, Iowa 51025
   Phone Toll Free: 800-827-1615 ext 235

2. Algoma Hardwoods, Inc.
   1001 Perry Street
   Algoma, Wisconsin 54201
   Phone Toll Free: 800-558-0155

3. Eggers Industries, Architectural Door Division
   164 North Lake Street
   Neenah, Wisconsin 54956
   Phone: 414-722-6444

4 Marshfield Door Systems
   1401 East Fourth Street
   Marshfield, Wisconsin 54449
   Phone Toll Free: 800-869-3667

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood doors for transparent finish: Solid core flush wood door for interior use; AWI premium grade.

1. Solid Core: Architectural Grade of 5-Ply Construction.
2. Model: AWI Type SCLC-5 (7 Ply not acceptable).
3. Style: Flush, or as indicated on door schedule.
4. Face: AWI Custom Grade/WDMA Premium Grade birch veneer, rift cut, random matched.
5. Core: Structural composite lumber.
6. Stile Edges: Matching hardwood stile edges bonded to core, 1 1/8" minimum after trim.
7. Crossband: Minimum 1/16” High Density Fiberboard (HDF) composite.
8. Rail Edges: Mill option softwood bonded to core, 1 1/18" minimum after trim.
9. Adhesive: Exterior or wet/damp interior use, Type I - Interior use, Type II.

B. Wood doors for labeled fire doors: Solid core flush wood door for interior use; AWI premium grade.

1. Model: AWI Type FD.
2. Style: Flush, or as indicated on door schedule.
3. Face: AWI Custom Grade/WDMA Premium Grade birch veneer, rift cut,

random matched.
4. Core: Non-combustible mineral (no asbestos).
5. Stile Edges: 5/8" after trimming treated hardwood.
6. Rail Edges: Top, 1/2" minimum treated. Bottom, 1 1/2" minimum treated.
7. Rating: As indicated on door schedule.

C. Door Lite Units

1. Provide metal lite kits.
2. Door lite units shall not be more than half-glass size.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fabrication:

1. General:
   a. Comply with AWI Quality Standards Section 1300 except to meet or exceed requirements herein specified.
   b. Completely factory prefit to require size ready for installation at project site, no on-jobsite trimming permitted.
   c. Prepare in accordance with frame shop drawings and schedule, hardware schedule, and templates.
2. Thickness: 1 3/4" thick unless indicated otherwise on door schedule.
3. Fabricating Tolerances:
   a. Prefit size + or -1/32" overall dimensions.
   b. Squareness: Length or diagonal measured on face of door from upper left corner to lower right corner with maximum difference of 1/8".
   c. Maximum warp 1/4".
   d. Show-through (telegraphing): 1/100" deviation from true plane in any 3" span on door face.

B. Preparation:

1. Examine door frames and verify frames are of correct type and have been installed for proper hanging of corresponding doors.

C. Installation:

1. Install in accordance with manufacturer's written instructions.
2. Install fire rated doors in accordance within NFPA 80.
3. Install accurately in frame, within clearances specified. Install hardware in accordance with manufacturer's written instructions and associated templates. Refer to general installations requirements.
4. Do not field cut doors down to opening sizes smaller than those for which doors were manufactured. Do not install doors in frames set out of plumb.
5. Install to operate freely, but not loosely, free from hinge bound conditions,

striking or binding. Do not install in frames which would hinder operation of doors. Hang free from rattling when in latched position.

D. Adjusting:

1. Adjust and check each door to ensure proper operating and function.
2. Replace or rehang doors which are hinge bound and do not swing or operate freely. Remove and replace doors which are warped, twisted, or which are not in true planes.
3. Replace doors that have been damaged during installation.

E. Factory Transparent Finish: Finish faces and vertical edges, seal top and bottom edges as required for warranty purposes. Wrap and protect.

1. Grade: Premium.
2. Finish: Manufacturer's standard UV cured polyurethane, equal to WDMA TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

END OF SECTION082100

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. GREEN GLOBE SUBMITTALS:

1. Recycled Content: Provide manufacturer's documentation indicating separate percentages, by weight, of post-consumer and pre-consumer recycled content. Also include material costs, excluding cost of installation.

2. Local/Regional Materials: Provide manufacturer's documentation indicating location of manufacturing facility and location where the base materials were extracted, mined, quarried, harvested, etc. Include address and distance to the project site for both manufacture and harvest. Also include material costs, excluding cost of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 tested according to the following test method:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Alfab, Inc.
4. Babcock-Davis.
5. Cendrex Inc.
6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
7. Jensen Industries; Div. of Broan-Nutone, LLC.
8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.
11. Maxam Metal Products Limited.
12. Metropolitan Door Industries Corp.
13. MIFAB, Inc.
14. Milcor Inc.
15. Nystrom, Inc.
16. Williams Bros. Corporation of America (The).

C. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

D. Flush Access Doors with Exposed Flanges :
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Walls and Ceiling requiring access.
3. Door Size: 24” x 24” or as required for proper access.
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage.

    a. Finish: Factory prime to receive paint.

5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

E. Hardware:

1. Latch: Cam latch operated by pinned-hex-head wrench.
2. Lock: Cylinder.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. 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.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Frame Anchors: Same type as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

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SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing.
2. Manual-swing entrance doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

C. Samples: For each type of exposed finish required.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Source quality-control reports.

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D. Field quality-control reports.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

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

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

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B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite, 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

    a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330/E 330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

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2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2. Entrance Doors:

a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.26 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

I. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests according to ASTM E 1996 for Wind Zone 4.

1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.
2. Small-Missile Test: For glazed openings located more than 30 feet (9.1 m) above grade.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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2.2 STOREFRONT SYSTEMS

A. Coral FL550 Impact Resistant Storefront Systems or equal.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally improved.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

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B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Cylinders: As specified in Section 087100 "Door Hardware."

E. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: Stainless steel, with stainless-steel pin.
3. Quantities:

a. For doors up to 87 inches (2210 mm) high, provide three hinges per leaf.
b. For doors more than 87 and up to 120 inches (2210 and up to 3048 mm) high, provide four hinges per leaf.

F. Continuous-Gear Hinges: BHMA A156.26.

G. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

H. Manual Flush Bolts: BHMA A156.16, Grade 1.

I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.

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J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

K. Cylinders: BHMA A156.5, Grade 1.

L. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

M. Operating Trim: BHMA A156.6.

N. Removable Mullions: BHMA A156.3 extruded aluminum.

1. When used with panic exit devices, provide keyed removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

O. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

P. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

Q. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

R. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

S. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

T. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

U. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.5 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

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C. Glazing Sealants: As recommended by manufacturer.

2.6 MATERIALS

A. Sheet and Plate: ASTM B 209 (ASTM B 209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.

D. Structural Profiles: ASTM B 308/B 308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according toapplicable SSPC standard.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

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G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

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G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

a. Perform a minimum of three tests in areas as directed by Architect.

b. Failures will require that additional tests be performed to verify proper installation of each opening.

2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

a. Perform a minimum of three tests in areas as directed by Architect.

b. Failures will require that additional tests be performed to verify proper installation of each opening.

3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 08 41 13

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware for the following:
      a. Swinging doors.
      b. Other doors to the extent indicated.

B. Related Sections:
   1. Division 08: Steel Doors and Frames.
   2. Division 08: Flush Wood Doors.
   3. Division 08: Aluminum Entrances and Storefronts.
   4. Division 08: Interior Glass Entrances

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate thefinal Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
      a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
   3. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.

g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve all lock functions and submitted keying schedule prior to the ordering of permanent cylinders.

E. Submittal shall be embossed or have the imprint of a Certified, up to date, Seal stamp.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

G. Fire-Rated Door Assembly Testing: Per NFPA80, submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has completed both standard and electrified Builders hardware and integrated access control installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant available during the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Supplier recognized by manufacturers to be a direct, factory-authorized distributor of the specified hardware products.
1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC), active in the DHI Continuing Education Program with an up to date Seal, and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project. Go to http://www.dhi/org/ to search list for local Architectural Hardware Consultants.

D Source Limitations: Obtain each type and variety of aluminum, steel and wood door hardware from the same single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.

2. NFPA 101 Life Safety Code 2010.

3. NFPA 80 – Standard for Fire Doors and Other Opening Protectives 2013.

4. ANSI/BHMA A156 requirements.

5. Florida Building Code 2020, 7th Edition.

6. Miami-Dade requirements for Hurricane (NOA) for exterior openings.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing. Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Review and verify lock function for every opening.
3. Plans for existing and future key system expansion.
4. Requirements for key control system.
5. Installation of permanent keys and cylinder cores as required.
6. Provide Key Biting List.
7. Provide extra Key Blank and Cylinders.
8. Address for delivery of keys.
9. Review and confirm all Electric/Electronic Opening Operational Descriptions where required.
10. Review and Coordinate all Access Control components where required.

G. Pre-Installation meeting: Conduct a Pre-Installation meeting including hardware supplier and hardware installers to verify correct hardware will be installed and that proper installation methods are understood will be followed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site

B. Tag each item or package separately with identification related to the final Door Hardware Schedule and include basic installation instructions with each item or package.

C. Deliver permanent keys, cylinders, and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

1.7 WARRANTY

A. General Warranty: Special warranties 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. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods: Five years for mortise and bored latches and locksets, five years for exit devices, and ten years for manual door closers.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware suppliers and installers. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated for named products listed in Hardware Sets.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule. (Source manufacturer listed in boldface).

2.2 HINGES

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

1. Butt Hinges:
   a. Stanley a Dormakaba Company (ST).
   b. PBB, Inc. (PB).
   c. Bommer Industries (BM).

B. Standards: BHMA Certified products complying with the following:
   1. Butts and Hinges: BHMA A156.1.
   2. Template Hinge Dimensions: BHMA A156.7.

C. Quantity: Provide the following, unless otherwise indicated:
   1. Two Hinges: For doors with heights up to 60 inches.
   2. Three Hinges: For doors with heights 61 to 90 inches.
   3. Four Hinges: For doors with heights 91 to 120 inches.
   4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches.

D. Hinge Size: Provide the hinges, sized as recommended by manufacturer to suit the application, unless otherwise indicated in hardware sets. Provide two hinges for doors up to 60” and one hinge for each additional 30” of height.

E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
   2. Interior Doors: Heavy weight, steel, ball bearing hinges unless Hardware Sets indicate standard weight.

F. Hinge Options: Comply with the following where indicated in the Door Hardware Scheduleor on Drawings:
   1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
      a. Out-swinging exterior doors.
      b. Out-swinging controlled doors.

2.3 DOOR BOLTS

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

   1. Flush Bolts:
      a. Trimco Manufacturing (TR).
      b. Burns Manufacturing (BU).
      c. Ives Hardware - Allegion (IV).

B. Standards: Comply with the following:
   1. Manual Flush Bolts: BHMA A156.16.

C. Flush Bolts: BHMA Certified Grade 1.

D. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be U.L. listed for labeled fire doors.

E. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.4 LOCKS AND LATCHES

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

1. Mechanical Bored Locks and Latches:
   a. DORMA a Dormakaba Company (DM) – C800 Series.
   b. Best Access Systems a Dormakaba Company (BE) – 9K Series.
   c. Sargent Manufacturing an Assa Abloy Company (SA) - 10-Line Series.
   d. Schlage Lock - Allegion (SC) - ND Series.

B. Standards: Comply with the following:
1. Bored Locks and Latches: BHMA A156.2.
2. Interconnected Locks and Latches: BHMA A156.12.
3. Auxiliary Locks: BHMA A156.5.

C. Bored Locks: BHMA Certified Grade 1, Series 4000.

D. Lock Trim: Match the following design style:
1. Lever: DORMA a Dormakaba Company (DM) - LC Trim.

E. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
1. Bored Locks: BHMA A156.2.

F. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Bored Locks: Minimum 1/2-inch latchbolt throw.

G. Backset: 2-3/4 inches unless otherwise indicated.

2.5 CYLINDERS AND KEYING

A. Provide cylinders utilizing a unique factory code pattern.

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

1. Cylinders:
   a. Best Access Systems a Dormakaba Company (BE) - Cylinders
   b.. Sargent Manufacturing an Assa Abloy Company (SA) - Cylinders.
   c.. Schlage Lock - Allegion (SC) - Cylinders.

C. Standards: Comply with the following:
1. Cylinders: BHMA A156.5.
2. Key Control System: BHMA A156.5.

D. Cylinder Grade: BHMA Certified Grade 1.

E. Keying System: Unless otherwise indicated, provide for a keying system complying with the following requirements:
1. New Best Cormax Master Key System: Cylinders are factory keyed operated by a change key and a master key. Conduct keying meeting with End User to define and document keying system instructions and requirements.

F. Keys: Provide nickel-silver keys complying with the following:
1. Stamping: Permanently inscribe each key with a visual key control number and as directed by Owner.
2. Quantity: Provide the following:
a. Cylinder Change Keys (Per Key Set): Three.
b. Master Keys: Five.

G. Key Registration List: Provide keying transcript list to Owner's representative for lock cylinders.

H. Key Control System: Provide one MMF Industries lockable cabinet for key control andstorage. Cabinet to provide for 50% future expansion.

2.6 STRIKES

A. Standards: Comply with the following:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Dustproof Strikes: BHMA A156.16.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated.

2.7 EXIT DEVICES

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

1. Exit Devices:
a. Precision Exit Devices a Dormakaba Company (PR) – Apex 2000 Series..
b. Von Duprin, An Allegion Company (VD) – Apex 2000 Series.
c. Sargent Manufacturing an Assa Abloy Company (SA) - 80 Series.

B. Standard: BHMA A156.3.

C. Exit Devices: BHMA Certified Grade 1.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing per UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing per UL 305 and NFPA 252.

F. Vertical Rod Exit Devices: Provide and install interior concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.

G. Outside Trim: Match design for locksets and latch sets, unless otherwise indicated.

2.8 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Surface-Mounted Closers (Heavy Duty):
   a. DORMA a Dormakaba Company (DM) - 8916 Series with heavy duty arms.
   b. Sargent Manufacturing an Assa Abloy Company (SA) - 351 Series with heavy duty arms.
   c. LCN Door Closers - Allegion (LCN) – 4030 Series with heavy duty arms.

B. Standards: Comply with the following:
1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Certified Grade 1.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force. Unless otherwise indicated, all door closers are to be mounted inside rooms not visible from a corridor or lobby.

E. Closer Options: As indicated in hardware sets, or required for proper installation, provide Manufacturers reinforcements for all door closer options including delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.9 OPERATING and PROTECTIVE TRIM UNITS

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

1. Metal Protective Trim Units:
   a. Trimco Manufacturing (TR).
   b. Burns Manufacturing (BU).
   c. Ives Hardware - Allegion (IV).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate protection plates from the following:

1. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.

D. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.

E. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.

2.10 STOPS, BUMPERS AND HOLDERS

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

1. Stops, Bumpers and Holders:
   a. Trimco Manufacturing (TR).
   b. Burns Manufacturing (BU).
   c. Ives Hardware - Allegion (IV).

B. Standards: Comply with the following:
1. Stops and Bumpers: BHMA A156.16.
2. Combination Overhead Holders and Stops: BHMA A156.8.
3. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Certified Grade 1.

D. Combination Overhead Stops and Holders: BHMA Certified Grade 1.

E. Combination Overhead Stops and Holders: Certified BHMA Grade 1.
1. DORMA a Dormakaba Company (DM) – 700 Series.
2. ABH (AB) - 4000 Series.
3. Rixson; an Assa Abloy Company. (RX) – 9 Series

F. Floor Stops: Do not use if wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
1. Where floor or wall stops are not appropriate, provide overhead stops.

G. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame. Code requires holes in frames be filled with product or fasteners.

2.11 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

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

1. Door Thresholds, Weatherstripping and Gasket Seals:
   a. National Guard Products (NA).
   b. Reese Products (RS).
   c. Pemko (PE) (Assa Abloy).

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.

D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing per UL 1784.
1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing per UL-10C.
1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies only where an intumescent seal is required by Door Manufacturer to meet IBCand UL-10C positive pressure labeling.

2.12 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws per manufacturers recognized installation standards for application intended.

2.13 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case, less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Finishes on locksets, latch sets and exit devices to incorporate an FDA recognized antimicrobial coating (AM) listed for use on medical and food preparation equipment that will suppress the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

E. BHMA Designations: Comply with base material and finish requirements indicated by the following:
1. BHMA 600: Primed for painting, over steel base metal.
2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
4. BHMA 630: Satin stainless steel, over stainless-steel base metal.
5. BHMA 689: Aluminum painted, over any base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine all roughing-in to verify actual product locations before door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with ANSI/BHMA A115 series.

B. Wood Doors: Comply with ANSI/BHMA A115-W series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Secure the services of an Architectural Hardware Consultant (AHC) to perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.
1. Architectural Hardware Consultant will inspect all swinging doors and hardware immediately following completion of installation and state in report whether installed work complies with or deviates from specifications or construction document requirements.
   a. Inspection Scope:

1) Inspect all swinging doors and door hardware.
2) Inspector to furnish a Field Quality Report, itemized per each individual opening, to the Architect within 7 days of the inspection, including:
   a) Deficiencies in workmanship and standard industry practices.
   b) Use of allowable products.
   c) Use of manufacturer recommended fasteners.
   d) Compliance with the ANSI 117.1 and Florida Accessibility Code.
   e) Proper door/frame/hardware clearances.
   f) Problems related to function, security, aesthetics, or maintenance.

b. Inspector Qualifications:
   1) Certified Architectural Hardware Consultant.
   2) Entirely independent of the supply side of the project, having no familial or financial relationship with any manufacturer, manufacturer's representative, distributor, installer or supplier used on this project.
   3) Full-time (40 hours per week) engaged in the writing of hardware specifications and on-site inspections.
   4) Approved by Architect. Go to http://www.dhi/org/ to search list for local Architectural Hardware Consultants.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Fire-Rated Door Assembly Testing: Upon completion of the installation, each fire door assembly in the project shall be tested to confirm proper operation of its closing device and that it meets all criteria of a fire door assembly as per current NFPA80 Edition. The inspection of the fire doors is to be performed by individuals with knowledge and understanding of the operation components of the type of door being subjected to testing who are acceptable by the Authority Having Jurisdiction (AHJ). A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The record shall list each fire door assembly throughout the project, and include each door number, and itemized list of hardware set components at each door opening, and each door location in the facility.

C. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of doors, and door hardware.
   2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Secure the services of a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

B. Secure the services of a Certified Fire Door Assembly Inspector to complete inspection requirements per current edition NFPA 80 Current Edition Chapter 5.

3.8 DOOR HARDWARE SETS

A. The hardware sets listed below represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect with corrections made prior to the bidding process.

Manufacturer List

Code	Name
BE	Best Access Systems
DM	Dorma Door Controls
NA	National Guard
PR	Precision
ST	Stanley
TR	Trimco

Option List

Code	Description
CD	CYLINDER DOGGING
HC	Hurricane Code Device
CSK	COUNTER SINKING OF KICK and MOP PLATES
MCS	Mullion Cap Spacer (600 Finish)
SN1	SET (4) SEX NUTS - 1 3/4" DOORS (Std)
NFHD	Narrow Frame Bracket - Heavy Duty Arms
SNB (2)	SEX BOLTS (2)
SNB (6)	SEX BOLTS (6)
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES

Finish List

Code	Description
AL	Aluminum
600	Primed for Painting
626	Satin Chromium Plated

630	Satin Stainless Steel
689	Aluminum Painted
GREY	Grey
US26D	Chromium Plated, Dull

Hardware Sets

SET #01 - Exterior Pair - Entry

Doors: 101

2	Continuous Hinge	661HD UL 83"	AL	ST
1	Removable Mullion	HCKR822 MCS	600	PR
1	Exit Device	HC 2103 X 1703C CD SNB (2)	630	PR
1	Exit Device	HC 2101 CD SNB (6)	630	PR
2	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	626	BE
2	Closer	8916 S-DST NFHD SN1	630	DM
2	Kick Plate	K0050 10" x 2" LDW B4E-HEAVY-KP CSK	630	TR
2	Gasketing	127SA x LAR		NA
1	Meeting Stile Astragal Set	9875 A (SET) x LAR		NA
2	Door Sweep	672 A x LAR		NA
1	Threshold	896S x LAR	AL	NA

SET #02 - Exterior - Restroom

Doors: 108, 109

1	Continuous Hinge	661HD UL 83"	AL	ST
1	Deadlock	8T3-7S PATD	626	BE
1	Closer	8916 S-DST NFHD SN1	630	DM
1	Pull Plate	1017-3	630	TR
1	Push Plate	1001-3	630	TR
1	Kick Plate	K0050 10" x 2" LDW B4E-HEAVY-KP CSK	630	TR
1	Gasketing	127SA x LAR		NA
1	Door Sweep	200 SA x LAR		NA
1	Threshold	896S x LAR	AL	NA

NOTE: Inside thumb turn only retracts dead bolt. Key in outside cylinder extends and retracts deadbolt.

SET #03 - Storage / Sever Rms.

Doors: 103, 104, 106

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	C880T LCE	626	DM
1	Cormax Core	1CM-7MJ12	626	BE

1	Closer	8916 AF89P SN1	689	DM
		NOTE: Mount Push Side		
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

SET #04 - Office

Doors: 102

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	C850T LCE	626	DM
1	Cormax Core	1CM-7MJ12	626	BE
1	Closer	8916 AF89P SN1	689	DM
		NOTE: Mount Pull Side		
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

SET #05 - Kitchenette

Doors: 105

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Lockset	C870T LCE	626	DM
1	Cormax Core	1CM-7MJ12	626	BE
1	Closer	8916 TH	689	DM
		NOTE: Template closer for hold door open at 90 degrees.		
1	Wall Bumper	1270CV	626	TR
3	Silencer	1229A	GREY	TR

SET #06 - Pair - Storage

Doors: 107

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
2	Manual Flush bolt	3913	626	TR
1	Lockset	C880T LCE	626	DM
2	Overhead Stop	702 S	626	DM
2	Mop Plate	KM050 4" x 1" LDW B4E HEAVY-KP CSK	630	TR
1	Door Sweep	601A FATT x LAR		NA
2	Silencer	1229A	GREY	TR

Opening List

Opening	Hdw Set	Opening Label
101	01	
102	04	
103	03	
104	03	
105	05	
106	03	
107	06	
108	02	
109	02	

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Glazed entrances.
   4. Interior borrowed lites.
   5. Storefront framing.

1.2 DEFINITIONS

A. Inter-space: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practicesfor maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, orfilm on interior surfaces of glass.
D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Specified Design Wind Loads: As indicated on Drawings, but not less than wind loads applicable to Project as required by ASCE 10 "Minimum Design Loads for Buildings and Other Structures":
   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
   d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
   e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
   f. Windborne-Debris-Impact-Resistance-Test Performance: Provide glazingfor aluminum-framed systems that pass large and small missile-impact testsand cyclic-pressure tests according to the requirements of The Florida Building Code.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. 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.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 6.0 mm thick and a nominal 1/2-inch- (12.7-mm) wide interspace.
   4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
      b. Solar Heat Gain Coefficient: NFRC 200.
      c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

A. Provide manufacturer’s documentation indicating separate percentages, by weight, of post-consumer and pre-consumer recycled content. Also include material costs, excluding cost of installation.

B. Provide manufacturer’s documentation indicating location of manufacturing facility and location where the base materials were extracted, mined, quarried, harvested, etc. Include address and distance to the project site for both manufacture and harvest. Also include material costs, excluding cost of installation.

C. Product Data: For each glass product and glazing material indicated.
D. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.
E. Glazing Schedule: Use same designations indicated on Drawings.
F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.
G. Provide Florida Product Approval numbers on submittals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Program.
B. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM c 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
C. Glazing for Fire-Rated Door and Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
D. Safety Glazing Products: It shall be the responsibility of the glazing supplier/subcontractor to provide safety glass in areas as required to meet the Florida Building and Testing requirements in 16 CFR 1201.
E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
    1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
    2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
    3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
    4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.
G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
    1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
   2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
   3. For uncoated glass, comply with requirements for Condition A.
   4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
   5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Tempered Glass: ASTM C 1048, Kind FT (Fully tempered), Type I (Transparent flat glass) Quality-Q-1, Class I (clear).
   1. Safety glazing locations are defined by the Florida Building Code for specific required locations.

D. Low-e-coated, tinted, insulating glass: (AT ALL EXTERIOR LOCATIONS)
   1. Basis of Design: Solarban 70XL Clear / Clear insulated unit.
   2. Overall Unit Thickness: 1 inch (30 mm).
   3. Thickness of Outdoor Lite: ¼".
   4. Outdoor Lite: Tinted heat-strengthened float glass
   5. Interspace Content: Argon.
   6. Indoor Lite: Clear heat strengthened fully tempered float glass

a. Thickness of Glass Ply: ¼".
1) Silicone-Coated Spandrel Glass: ASTM C1048, Type I, Condition C, Quality-Q3 at locations indicated on drawings.
7. Low-E Coating: Pyrolytic or sputtered on second surface.
8. Summer Daytime U-Factor: 0.45 maximum.
9. Solar Heat Gain Coefficient: 0.25 maximum.
10. Provide safety glazing labeling.
11. Glass color: Clear

2.2 GLAZING GASKETS

A. Lock-Strip Gaskets: Aluminum door and window manufacturer's standard extrusions in size
and shape required, fabricated into frames with molded corner units and lock stirps, complying with ASTM C 542, black.
B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM c 1115.
5. Any material indicated above.
C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
B. Elastomeric Glazing 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.

1. Single-Component Neutral-Curing Silicone Glazing Sealants:
   a. Products:
      1) Dow Corning Corporation; 790.
      2) GE Silicones; SilPruf LM SCS2700.
      3) GE Silicones; SilPruf SCS2000.
      4) Pecora Corporation; 964.
      5) Pecora Corporation; 890
      6) Polymeric Systems Inc.; PSI-641.
      7) Soneborn, Div. Of ChemRex, Inc.; Omniseal.
      8) Tremco; Spectrem 3.
   b. Type and Grade: S (single component) and NS (non-sag).
   c. Class: 50.
   d. Use Related to Exposure: NT (non-traffic).
   e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
   1. Type 1, for glazing applications in which tape acts as the primary sealant.
   2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type C (closed-cell material with a surface skin)), polyurethane foam rod, oversized 20 to 50 percent larger than joint width, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control glazing sealant depth and otherwise contribute to producing optimum sealant performance.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 GLAZING

A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
   1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
   2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
   3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
   4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
   5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
   6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
   7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
   1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
3. Apply heel bead of elastomeric sealant.
4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
5. Apply cap bead of elastomeric sealant over exposed edge of tape.

C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
3. Install gaskets so they protrude past face of glazing stops.

D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact withglass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

3.3 GLASS SCHEDULE

A. TYPE **CG**: **Clear Class**
At designated locations provide:
Nominal ¼” thick clear float glass

B. TYPE **TG**: **Tempered Glass**
At designated location provide:

Nominal ¼" thick fully tempered clear float glass

C. TYPE **LG**: **Laminated Glass**

At designated exterior locations provide:
Exterior Pane: ¼" clear fully tempered float glass.
Interlayer: 0.090 inch thick complying with large missile impact testing and wind speed Requirement of Florida Building Code.
Interior Pane: Same as type **'TG"** (tempered glass) as above.

D. TYPE **XG**: **Insulated, Tempered, Low 'e' Glass**

At all exterior locations:
Exterior Pane: ¼' Solarban 70XL tinted heat-strengthened float glass,
Airspace: ½" air space
Interior Pane: ¼" clear fully tempered float glass (spandrel glass where indicated)

END OF SECTION 08 80 00

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G40 (Z120).

B. Studs and Tracks: ASTM C645.
   1. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
   2. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

   1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing minimum vertical movement.

   2. Single Long-Leg Track System: ASTM C645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
   3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
   4. Deflection Track: Steel sheet top track manufactured to prevent cracking offinishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodatedepth of studs.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Steel Thickness: **0.0329 inch (0.836 mm)**.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: **1-1/2 inches (38 mm)**.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.
   1. Minimum Base-Steel Thickness: **0.0329 inch (0.836 mm)**.
   2. Depth: **1-1/2 inches (38 mm)**.

G. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
   1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

   1. Depth: **3/4 inch (19 mm).**
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
   3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-steel thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58 or AC308 as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Type: Torque-controlled, expansion anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet, **1 by 3/16 inch (25 by 5 mm) by length indicated**.

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: **2-1/2 inches (64 mm)**.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Tracks: ASTM C645.

a. Minimum Base-Steel Thickness: **0.0329 inch (0.836 mm)**.
- Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22 mm) deep.

a. Minimum Base-Steel Thickness: **0.0329 inch (0.836 mm)**.

4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

    a. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel 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:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks 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 that penetrate 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 track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. 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. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced **24 inches (610 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 (610 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 (305 mm) from corner and cut insulation to fit.

G. 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.

3.3 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. 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 spacings 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.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

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.

END OF SECTION 09 22 16

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.
1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

B. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
1. Core: **5/8 inch (15.9 mm), Type X**.

2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: **5/8 inch (15.9 mm), Type X**.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
1. Core: **5/8 inch (15.9 mm), Type X**.
2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

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. U-Bead: J-shaped; exposed short flange does not receive joint compound.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: 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 setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

C. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) 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.

D. 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.

E. Prefill open joints, rounded or beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

H. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.2 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.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Porcelain tile.
2. Glazed wall tile.
3. Stone thresholds.
4. Tile backing panels.
5. Waterproof membrane for thinset applications.
6. Crack isolation membrane.
7. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of **mud** floors, gauged porcelain tile/gauged porcelain tile panels and slabs and large format tile.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies withANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile Types
   1. Refer to Drawings Finish Schedule.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of [**10**] [**12**] according to ASTM C1353 or ASTM C241/C241M and with honed finish.

   1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A.

1.
1. Thickness: As indicated.

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product**,** that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.6 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.7 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
1. For wall applications, provide nonsagging mortar.

C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
1. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
3. For wall applications, provide nonsagging mortar.
4. <Double click to insert sustainable design text for adhesives.>

2.8 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Standard Cement Grout: ANSI A118.6.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; white zinc alloy, exposed-edge material.

C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

   a. Exterior tile floors.
   b. Tile floors in wet areas.
   c. Tile swimming pool decks.
   d. Tile floors in laundries.
   e. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
   f. Tile floors consisting of rib-backed tiles.

B. 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.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Glazed Wall Tile: 1/8 inch (3.2 mm).
   2. Porcelain Tile: 1/4 inch (6.4 mm).

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in **modified dry-set** mortar (thinset).

K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

M. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

N. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

O. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F111 and ANSI A108.1A; cement mortar bed (thickset) with cleavage membrane.

2. Ceramic Tile Installation : TCNA F113; thinset mortar.

B. Interior Wall Installations, Masonry or Concrete:

1. Ceramic Tile Installation: TCNA W202; thinset mortar.

C. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W221 and ANSI A108.1A

END OF SECTION 09 30 13

SECTION 09 90 00 – PAINTING

PART 1 – GENERAL

1.01 SUMMARY

A. Provide painting and surface preparation for all unfinished interior and exterior surfaces, including electrical and mechanical equipment.
B. Exposed metal decking to be painted

1.02 SUBMITTALS

A. Submit for approval samples, product data, mock-ups, extra stock.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. First-line standard products for all systems by Benjamin-Moore, Coronado, Devoe, Glidden, PPG, Pratt and Lambert, Sherwin-Williams, Tnemec, or approved equal.

B. Exterior paint systems:

1. Concrete masonry units: 100% acrylic block filler – 1 coat, 100% acrylic enamel (semi-gloss) - 2 coats.
2. Ferrous metal: Rust inhibitive metal primer – 1 coat, 100% acrylic enamel (high-gloss) - 2 coats.
3. Galvanized metal: Galvanized metal primer – 1 coat, 100% acrylic enamel (high-gloss) - 2 coats.

C. Interior paint systems:

1. Gypsum Board and Veneer plaster: Acrylic latex primer – 1 coat, acrylic latex enamel (eggshell) - 2 coats.
2. Concrete masonry units: 100% acrylic block filler, acrylic latex enamel (semi-gloss), 2 coats.
3. Concrete masonry units (heavy duty): epoxy block filler, 2-component epoxy enamel (high-gloss), 2 coats.
4. Wood for natural transparent finish: Sanding sealer, waterborne clear-satin varnish, 2 coats.
5. Ferrous metal: Rust inhibitive metal primer, 100% acrylic enamel (high-gloss), 2 coats.

6. Galvanized metal: Galvanized metal primer, 100% acrylic enamel (high-gloss), 2 coats.

D. Mildewcide additive:

1. Provide mildewcide additive to all exterior paint. Mildewcide additive shall be chemically compatible with paint formulation and shall not adversely affect the color, texture, or durability of the coating.
2. Mildewcide additive shall be EPA registered, non-toxic, low VOC composition, and shall provide complete protection against microbial defacement of painted surfaces.
3. Provide M-1 Advanced Mildewcide as manufactured by The Jomaps Company or approved equal.

2.02 ENVIRONMENTAL CRITERIA

A. VOC Content of Paints:

1. The volatile organic compound (VOC) content of interior paints, interior primers, and anti-corrosive paints used in interior applications shall not exceed the limits defined in the Green Seal Environmental Standards for Paints (GS-11, dated 5/20/93) and Anti-Corrosive Paints (GC-03, dated 1/7/97), of Green Seal, Washington, DC. The VOC limits defined in the referenced Green Seal standards are as follows. All VOC limits are defined in grams per liter, and exclude water and tinting color added at the point of sale (as determined by U.S. EPA Reference Test Method 24).

a) Flats: 50 g/L.
b) Non-Flats: 150 g/L.
c) Anticorrosive Gloss, Semi-Gloss, & Flat: 250 g/L.
d) Clear Varnish: 350 g/L.
e) Clear Lacquer: 550 g/L.
f) Floor Coatings: 100 g/L.
g) Waterproofing Sealers: 250 g/L.
h) Sanding Sealers: 275 g/L.
i) Other Sealers: 200 g/L.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.

C. Match approved mock-ups for color, texture, pattern and coverage. Re-coat or remove and replace work which does not match.

B. Clean up, touch up and protect work.

3.02 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.
   a. Application of coating indicates acceptance of surfaces and conditions.

3.03 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Coordination of shop-applied prime coats with topcoats is critical.

2. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer. but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.04 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

    a. Equipment, including panelboards and switch gear.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Tanks that do not have factory-applied final finishes.
    h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 90 00

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SECTION 10 21 13 – HDPE PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes high density polyethylene toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.

C. Samples for each type of toilet compartment material indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

A. Toilet-Enclosure Style: Overhead braced, Floor anchored.

B. Urinal-Screen Style: Wall hung, Floor anchored.

C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

D. Pilaster Shoes and Sleeves (Caps): Stainless steel.

E. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters or 1-3/4-inch- (44-mm-) square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.

F. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, clear-anodized aluminum or stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.

1. Material: Clear-anodized aluminum or Stainless steel.
2. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

B. Hardware and Accessories: Manufacturer's heavy-duty stainless-steel operating hardware and accessories.

1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use

stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

   a. Pilasters and Panels: 1/2 inch (13 mm).
   b. Panels and Walls: 1 inch (25 mm).

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.

   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors

to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

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SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
   1. Low Profile Orbit ABC - FE 10V extinguisher, UL-rated 4A-80B:C, 10 lb.
   2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red or black baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

      a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: Top of fire extinguisher to be at 42 inches **(1067 mm)** above finished floor.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

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SECTION 150620
POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PHASE 1 - GENERAL

1.01 SCOPE OF WORK:

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and install in the locations as shown on the Drawings.

B. The CONTRACTOR shall install the plastic piping, fittings and appurtenances (as specified herein) as shown on the Drawings.

1.02 DESCRIPTION OF SYSTEM:

The CONTRACTOR shall install the piping in the locations as shown on the Drawings.

1.03 QUALIFICATIONS:

A. All plastic pipe, fittings and appurtenances shall be furnished by a single Manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished.

B. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.04 SUBMITTALS:

A. The CONTRACTOR shall submit Shop Drawings that include dimensions and technical specifications for all piping to the ENGINEER.

B. The CONTRACTOR shall submit samples of all materials specified herein to the ENGINEER.

C. The CONTRACTOR shall submit and shall comply with pipe Manufacturer’s recommendation for handling, storing, and installing pipe and fittings.

D. The CONTRACTOR shall submit pipe Manufacturer’s certification of compliance with these Specifications.

1.05 TOOLS:

The CONTRACTOR shall furnish special tools, solvents, lubricants, and caulking compounds required for normal installation with the pipe.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Polyvinyl Chloride (PVC) Pipe:

1. Pressure PVC pipe and accessories 3 inches and smaller in diameter, where shown or as specified in the Drawings, shall meet the requirements of American Society for Testing and Materials (ASTM) D2241 “Polyvinyl Chloride (PVC) Pressure Pipe,” and shall be SDR 21, rated pressure of 200 pounds per square inch.

2. PVC Pipe **4 to 8** inches in diameter shall meet the requirements of American Water Works Association (AWWA) Specifications C900 “Polyvinyl Chloride (PVC) Pressure Pipe,” and shall be **DR18 (Pressure Class 235).**

3. PVC Pipe **10 and 12** inches shall meet the requirements of AWWA C900 and shall be **DR18 (Pressure Class 235).**

4. AWWA C900 **DR18 (Pressure Class 235)** pipe shall be required for all PVC fire lines downstream of any check valve.

5. PVC Pipe **greater than 12** inches shall meet the requirements of AWWA C900 and shall be **DR18 (Pressure Class 235).**

6. Provisions shall be made for expansion and contraction at each joint with an elastomeric ring, and shall have an integral thickened bell as part of each joint.

7. PVC pipe shall be installed as recommended by the Manufacturer.

8. Pipe shall be furnished in nominal lengths of approximately 20 feet, unless otherwise directed by the ENGINEER.

9. Pipe and accessories shall bear the NSF mark indicating pipe size, Manufacturer’s name(s), AWWA and/or ASTM Specification Number, working pressure, and production code.

10. Pipe shall be <u>blue</u> for potable water service, <u>green</u> for sewage force main service, and <u>purple</u> for reclaimed water mains (Pantone 522C).

11. All potable water pipe shall be NSF certified and copies of lab certification shall be submitted to the ENGINEER.

B. Joints:

1. The PVC joints for pipe shall be of the push-on type unless otherwise directed by the ENGINEER so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment.

2. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket; thereby, compressing the gasket radially to the pipe to form a positive seal.

3. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the jointis assembled.

4. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 750 degrees Fahrenheit (F) in each joint per length of pipe.

5. The bell shall consist of an integral wall section with a solid cross section elastomeric ring which shall meet requirements of ASTM F-477.

6. The thickened bell section shall be designed to be at least as strong as the pipe wall.

7. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall not have deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to the water.

C. Fittings and Specials:

1. All fittings for PVC pipe shall be cast iron/ductile iron with mechanical joints and shall conform to the specifications for cast iron/ductile iron fittings, unless otherwise directed by the ENGINEER. PVC C-900 fittings are allowable upon approval by theENGINEER and required for sewage force main applications. DR ratio shall be the same as the pipe.

2. Fittings for Schedule 80 PVC pipe less than 3 inches in diameter shall be threaded and be PVC as shown on the Drawings, or as directed by the ENGINEER. Threaded PVC fittings shall conform to ASTM Specification D2464-69.

3. The Manufacturer of the pipe shall supply all PVC accessories as

well as any adaptors and/or specials required to perform the Work as shown on the Drawings and specified herein.

4. Standard double bell couplings will not be accepted where the pipe will slip completely through the coupling.

2.02 COPPER LOCATION WIRE:

A. The CONTRACTOR shall install all piping (including service lines) with underground 12 gauge single conductor thermoplastic high heat-resistant nylon (THHN) insulated traceable copper wire.

B. The CONTRACTOR shall lay the insulated copper wire in the pipe trench 3 to 6 inches above the sewer force mains and shall be a continuous strand from valve box to valve box, wrapped two times around each valve and extended 24 inches inside each valve box to enable location devices to be attached without digging up the valve box.

C. The CONTRACTOR shall insulate all wire splices.

D. The CONTRACTOR shall backfill the trench following placement of the traceable wire with due caution to prevent displacement or damage towire.

E. The CONTRACTOR shall perform a detection test after insulation and backfill have been completed in the ENGINEER's presence using a commercially available pipe detector furnished by the CONTRACTOR.

F. The CONTRACTOR shall replace any undetectable wire to the satisfaction of the ENGINEER at no additional expense to the OWNER.

PART 3 - EXECUTION

3.01 STORAGE/INSTALLATION:

A. The CONTRACTOR shall be in strict accordance with the Manufacturer's technical data and printed instruction for the storage and installation of plastic pipe.

B. The CONTRACTOR shall cover all plastic pipe to prevent fading.

C. The OWNER reserves the right to reject any pipe not properly stored or pipe that has faded.

3.02 INSPECTION AND TESTING:

A. The CONTRACTOR shall not disturb all pipelines for 24 hours to develop

complete strength at all joints.

B. General:

1. Provide temporary equipment for testing, including pump and gauges.

2. Test piping system before insulation is installed (wherever feasible) and remove control devices before testing.

3. Expel air from the pipe before applying the specified test pressure.

4. Make taps (if necessary) at points of highest elevation, and afterwards tightly plugged.

5. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.

6. Fill each section with water and subject to a hydrostatic pressure equal to the pressure rating of the pipe being tested.

C. The CONTRACTOR shall test for the required 2-hour period.

D. The CONTRACTOR shall test pipe at 150 pounds per square inch (psi), except where fittings are lower class or pressure rating.

1. Pressure Sewer Permissible leakage (2.2 gallons/1,000 feet/24 hours/inch diameter):

2.

Inches	gallons/1,000 feet/24 Hours	gallons/1,000 feet/1 Hours
2”	4.4 gal.	0.19 gal.
3”	6.6 gal.	0.28 gal.
4”	8.8 gal.	0.37 gal.
6”	13.2 gal.	0.55 gal.
8”	17.8 gal.	0.74 gal.
10”	22.0 gal.	0.92 gal.
12”	26.4 gal.	1.10 gal.
14”	30.8 gal.	1.29 gal.
16”	35.2 gal.	1.47 gal.
18”	39.6 gal.	1.66 gal.

3. Water System Permissible Leakage:

Inches	gallons/1,000 feet/24 Hours	gallons/1,000 feet/1 Hours
2”	3.6 gal.	0.15 gal.
3”	5.4 gal.	0.23 gal.
4”	7.2 gal.	0.30 gal.
6”	10.8 gal.	0.45 gal.
8”	14.4 gal.	0.60 gal.
10”	18.0 gal.	0.75 gal.
12”	21.6 gal.	1.90 gal.
14”	25.2 gal.	1.05 gal.
16”	28.8 gal.	1.66 gal.
18”	32.4 gal.	1.66 gal.

E. The CONTRACTOR shall repair piping systems sections which fail required piping tests by disassembly and re-installation using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

F. The CONTRACTOR shall, at his own expense, locate and repair the defective joints should any test of combined sections of pipe laid disclose leakage greater than the specified limit, until the leakage is within the specified allowance.

G. The CONTRACTOR shall provide water for testing.

H. The CONTRACTOR may subject pipe to hydrostatic pressure, inspect and test for leakage at any convenient time after partial completion of backfill.

I. The CONTRACTOR may test the system with joints exposed or backfilling complete at his/her option. The ENGINEER shall be notified at least 48 hours before beginning testing.

J. The CONTRACTOR shall drain test water from piping systems after testing and repair work has been completed.

3.03 CLEANING, FLUSHING, AND INSPECTING:

A. General:

1. Clean installed piping systems' exterior surfaces of superfluous materials and prepare for application of specified coatings (if any).

2. Flush out piping systems with clean water before proceeding with required tests.

3. Inspect each run of each system for completion of joints, supports, and accessory items.

B. The CONTRACTOR shall thoroughly flush each run of pipe after themains have been laid and pressure tested so as to remove all debris and foreign matter from the lines.

1. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipe line.

2. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipe line shall be opened and flumes or piping shall be provided by the

CONTRACTOR to waste the water to the nearest approved disposal point.

3. A minimum volume of water equal to six times the volume of the main shall be used to flush the mains.

4. The water shall be introduced into the mains to produce a velocity of not less than 3 feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

C. The CONTRACTOR shall inspect pressure piping in accordance with American Society of Mechanical Engineers (ASME) B31 procedures.

D. The CONTRACTOR shall disinfect water mains and water service piping in accordance with AWWA C601 and the Florida Department of Environmental Protection (FDEP), Chapter 17-22 requirements.

E. The CONTRACTOR is responsible for costs (including sampling and analysis) associated with disinfecting the potable water lines.

F. The CONTRACTOR shall submit sample results documenting compliance with disinfection testing requirements to the FDEP with a duplicate copy sent to the ENGINEER.

END OF SECTION 150620

SECTION 15070
HDPE PIPE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section includes material and installation requirements necessary for furnishing and installing high-density polyethylene (HDPE) pipe, fittings, and specials in the locations and quantities as shown on the drawings.

B. Quantities shown on the plans may not be the exact length needed for directional bores.

C. The CONTRACTOR shall investigate this before the Bid and shall inform the ENGINEER prior to the Bid if additional HDPE pipe will be needed.

D. The CONTRACTOR will be responsible for any additional HDPE pipe needed after the Bid and additional costs incurred for the pipe shall not be required from the OWNER.

1.02 QUALITY CRITERIA

A. Reference to industry standards as contained herein shall be construed as to be in reference to the latest revision or edition. All HDPE pipe shall meet all American Water Works Association (AWWA) Standards.

B. The pipe fittings and specials shall be made by a Manufacturer experienced in producing pipe, fittings, and specials of the type, size, configuration, and quality specified herein. The manufacturer shall have produced pipe, fittings and specials having a record of at least 5 years successful performance.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings showing the pipe lengths, design details, joint details, specials, etc., for the ENGINEER's approval. Pipe shall be fabricated in accordance with these plans.

B. The CONTRACTOR shall submit a notarized statement of certification from the pipe Manufacturer as to conformance with the specified American National Standards Institute (ANSI)/AWWA Specifications listed herein, and modifications thereto, at the time of submitting Shop Drawing data on the pipe and fittings.

1.04 DELIVERY, STORAGE AND HANDLING

A. The CONTRACTOR shall be responsible for the acceptability of all material furnished by him/her and shall assume responsibility for the replacement of all such material found damaged in shipping or defective inmanufacture. This shall include furnishing all material and labor required for the replacement of installed material discovered to be defective prior tothe final acceptance of the Work.

B. The CONTRACTOR shall keep the interior and all sealing surfaces of all pipe, fittings, and other accessories free from dirt and foreign matter. Consult the Manufacturer for specific storage recommendations.

C. The CONTRACTOR shall properly handle materials at all times to prevent damage in accordance with Manufacturer's recommendations. Pipe and fittings shall not be thrown, dropped, or dragged.

PART 2 - PRODUCTS

2.01 HDPE PIPE: 2-INCH DIAMETER AND SMALLER

A. The HDPE tubing shall be manufactured in accordance with American Society for Testing and Materials (ASTM) D2737 and comply with AWWA C901 specifications. All HDPE PE-4710 tubing used for force mains shall be green symbolizing wastewater and all HDPE PE-4710 tubing used for water mains shall be blue symbolizing water.

B. The HDPE tubing shall be rated for use with water at 73.4 degrees Fahrenheit (F) at a hydrostatic design stress of 800 psi and a minimum working pressure of 160 psi.

C. All HDPE tubing **2-inch diameter and smaller** shall be iron pipe size (IPS). Standard Dimension Ratio (SDR) shall be **SDR9 for the HDPE** pipe shown on the drawings. Dimensions and workmanship shall be as specified by ASTM D2737.

D. Polyethylene extrusion compound from which the HDPE pipe is extruded shall comply with application requirements for PE-4710 high molecular weight polyethylene plastic material.

2.02 FITTINGS AND JOINTS

A. Fittings shall be fabricated using DIP AWWA C153 with epoxy liner, as manufactured by Tyler or approved equal.

B. The CONTRACTOR shall use couplings Ford FC1 or equal with epoxy liner and restrained glands, Ford Series 1300 for transition connections as

shown on the plans.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The CONTRACTOR shall install of all HDPE pipe, fittings, specials, and appurtenances in accordance with the Manufacturer's instructions.

B. The CONTRACTOR shall securely close openings such as stubs, tees and other services along the lines with an approved stopper that fits into the pipe and is recommended by the pipe Manufacturer. This stopper shall be jointed in such a manner that it may be removed at some future time without injury to the pipe itself.

C. The CONTRACTOR shall temporarily close the end of the pipe with a close-fitting stopper at the close of each day's work and at other times when the pipe is not being laid.

D. Cleaning:

1. All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipelines.

2. As the work progresses, the interior of the main shall be cleaned of all dirt, jointing material, and superfluous materials of every description.

E. Experienced fusion technicians with a minimum of 5 years or more experience in field application involving large diameter (over 12 inches) HDPE pipe shall join piping. Experience record shall be submitted for review 15 days prior to directional boring activities.

F. If the CONTRACTOR feels that the length of HDPE pipe shown on the plans is not adequate, then the CONTRACTOR shall notify the ENGINEER prior to the Bid. The CONTRACTOR shall not ask for additional directional boring cost after the Bid.

G. Handling:

1. Pipe must be handled in a way to ensure that it is not gouged or scratched to a depth of more than 10% of the wall thickness.

2. Pipe shall not be bent to a radius of less than the Manufacturer's recommendation at any time during installation.

3. Pipe shall be handled at all times with strapping that a combined width at each load area of at least half the pipe diameter to prevent

point damage to the pipe. No wire rope slings shall be used.

PART 4 – TESTING

4.01 TESTING IN THE TRENCH

A. The CONTRACTOR shall fill the pipeline with water after it has been laid; bleed off any trapped air.

B. The CONTRACTOR shall subject the lowest element in the system to a test pressure that is 1.5 times the design pressure and check for any leakage.

C. The CONTRACTOR shall apply the pressure test after backfilling has been completed but not sooner that a time which will allow sufficient curing of any concrete that may have been used, when in the opinion of the ENGINEER, local conditions require that the trenches be backfilled immediately after the pipe has been laid. Typical minimum concrete curing times are 36 hours for early strengths and 7 days for normalstrengths.

1. The test procedures consist of two steps: the initial expansion and the test phase.

2. When test pressure is applied to a water-filled pipe, the pipe expands. During the initial expansion of the pipe under test sufficient make-up water must be added to the system at hourly intervals for 3 hours to maintain the test pressure.

3. After about 4 hours, initial expansion should be complete and the actual test can start.

4. When the test is to begin, the pipe is full of water and is subjected to a constant test pressure of 1.5 times the system design pressure.

5. The test phase should not exceed 3 hours, after which time any water deficiency must be replaced and measured. Add and measure the amount of make-up water required to return to the testpressure and compare this to the maximum allowance in **Figure4.1**.

6. An alternate leakage test consists of maintaining the test pressure (described above) over a period of 4 hours, and then dropping the pressure by 10 psi (0.069 Mpa). If the pressure that remains is within 5% of the target value for 1 hour, then that is an indication that there is no leakage in the system.

***NOTE**: Under no circumstances shall the total time under test exceed 8 hours at 1 ½ times the system pressure rating. If the test is not complete within this time limit (due to leakage, equipment failure, etc.), the test section shall be permitted to "relax" for 8 hours prior to the next test sequence. Air testing is not recommended. Additional safety precautions may be required.*

FIGURE 4.1
ALLOWANCE FOR EXPANSION UNDER TEST PRESSURE

Nominal Pipe Size Inches (1)	U.S. Gals/100 feet of Pipe (2)			Nominal Pipe Size Inches (1)	U.S. Gals/100 feet of Pipe (2)		
	1-Hour	2-Hour	3-Hour		1-Hour	2-Hour	3-Hour
2	0.08	0.12	0.15	20	2.80	5.50	8.00
3	0.10	0.15	0.25	22	3.50	7.00	10.50
4	0.13	0.25	0.40	24	4.50	8.90	13.30
5	0.21	0.41	0.63	28	5.50	11.10	16.80
6	0.30	0.60	0.90	30	6.20	12.60	19.10
8	0.50	1.00	1.50	32	7.00	14.30	21.50
10	0.75	1.30	2.10	36	9.00	18.00	27.00
12	1.10	2.30	3.40	42	12.00	24.00	36.00
14	1.40	2.80	4.20	48	15.00	27.00	43.00
16	1.70	3.30	5.00	54	18.00	30.00	50.00
18	2.20	4.30	6.50				

(1) mm* 0.03937
(2) multiply by 11.53 to convert to liter/100 meters of pipe

END OF SECTION
150700

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SECTION 151010
VALVES AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all buried and non-buried valves as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit materials required to establish compliance with these Specifications in accordance with Section 01300. Submittals shall include the following:

1. Certified drawings showing all important details of construction and dimensions.

2. Descriptive literature, bulletins and/or catalogs of the equipment.

3. The total weight of each item.

4. A complete bill of materials.

5. Additional submittal data, where noted with individual pieces of equipment.

B. Test Reports: Provide certified hydrostatic test data, per Manufacturers standard procedure or MSS-SP-61 for all valves.

C. Certificates: For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

D. Manufacturer’s Installation and Application Data

E. Operating and Maintenance Data: Operating and maintenance instructions shall be furnished to the ENGINEER. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM A48 - Specification for Gray Iron Castings.
2. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
3. ASTM A159 - Specification for Automotive Gray Iron Castings.
4. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
5. ASTM A276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
6. ASTM A436 - Specification for Austenitic Gray Iron Castings.
7. ASTM A536 - Specification for Ductile Iron Castings.
8. ASTM B30 - Specification for Copper-Base Alloys in Ingot Form.
9. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings

B. American Water Works Association (AWWA):

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
2. AWWA C500 - Gate Valves, 3-in Through 48-in NPS, for Water and Sewage Systems
3. AWWA C504 - Rubber-Seated Butterfly Valves
4. AWWA C507 - Ball Valves 6-in Through 48-in
5. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-in Through 24-in NPS
6. AWWA C509 - Resilient-Seated Gate Valves, 3-in Through 12-in NPS, for Water and Sewage Systems
7. AWWA C511 - Reduced Pressure Principle Backflow Prevention Assembly

8. AWWA C540 - Power-Actuating Devices for Valves and Sluice Gates

9. AWWA C550 - Protective Interior Coatings for Valves and Hydrants

10. AWWA C800 - Underground Service Line Valves and Fittings

11. AWWA C515 – Resilient Seated Valves for 14” and Larger

C. American National Standards Institute (ANSI):

1. ANSI B2.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).

2. ANSI B16.1 - Cast Iron Pipe Flange and Flanged Fittings Class 25, 125, 250 and 800

3. ANSI B16.10 - Face-to-Face and End-to-End Dimensions of Valves

4. ANSI B16.104 - Butterfly Valves

D. American Iron and Steel Institute (AISI).

E. Manufacturer’s Standardization Society of the Valve and Fittings Industry (MSS):

1. MSS-SP-61 - Pressure Testing of Steel Valves.

2. MSS-SP-67 - Butterfly Valves.

3. MSS-SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

4. MSS-SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

5. MSS-SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Services.

6. MSS-SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

7. MSS-SP-80 - Bronze Gate, Globe, Angle and Check Valves.

8. MSS-SP-82 - Valve Pressure Testing Methods

9. MSS-SP-98 - Protective Epoxy Coatings for Interior of Valves and Hydrants.

F. National Electrical Manufacturers Association (NEMA).

G. Underwriters Laboratories (UL).

H. Factory Mutual Insurance (FM).

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Valves and appurtenances shall be products of well established firms who are fully experienced, minimum 10 years, reputable and qualified in the manufacture of the particular equipment to be furnished.

2. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

3. All units of the same type shall be the product of one Manufacturer.

B. Certifications:

1. The Manufacturer’s shall furnish an affidavit of compliance with Standards referred to herein as specified in paragraph 1.03C.

2. Refer to Part 3 for testing required for certain items in addition to that required by referenced standards.

C. Provide the services of a qualified and factory-trained service representative of the Manufacturer to provide operational andmaintenance instruction, for a one-day, eight hour period for:

1. Valve motor operators.

2. Valve hydraulic operators.

3. Valve pneumatic operators.

4. Pressure regulating valves.

5. Air release, air and vacuum valves.

D. Inspection of the units may also be made by the ENGINEER or other representative of the OWNER after delivery. The equipment shall be subject to rejection at any due to failure to meet any of the Specification

requirements, even though submittal data may have been accepted previously. Equipment rejected after delivery shall be marked for identification and shall be removed from the job site at once.

1.05 SYSTEM DESCRIPTION

A. All of the equipment and materials specified herein is intended to be standard for use in controlling the flow of wastewater, sludges, reclaimed water, potable water, air or chemicals, depending on the individual systems, as noted on the Drawings.

B. Valves, appurtenances and miscellaneous items shall be installed as shown on the Drawings and as specified, so as to form complete workablesystems.

1.06 MAINTENANCE

A. Special tools and the Manufacturer's standard spare parts, if required for normal operation and maintenance, shall be supplied with equipment.

B. Provide all special tools required for normal maintenance.

C. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

D. Provide to the OWNER a list of all spare and replacement parts with individual prices and location where they are available.

E. Prices shall remain in effect for a period of not less than one year after start-up and final acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT - GENERAL

A. Reference is made to Division 1 for additional requirements, including nameplates, provisions for temporary pressure gages, protection against electrolysis and anchor bolts.

B. The use of a Manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves and appurtenances shall be of the size shown on the Drawings or as noted and as far as possible equipment of the same type shall be identical and from one Manufacturer.

D. Valves and appurtenances shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or indelibly marked upon some appropriate part of the body.

E. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.

F. Joints, size and material - unless otherwise noted or required by the ENGINEER:

1. Except where noted, all joints referred to herein shall be of the same type, nominal diameter, material and with a minimum rating equal to the pipe or fittings they are connected to.

2. Valves and appurtenances shall be of the same nominal diameter as the pipe or fittings they are connected to.

3. All valves exposed to view, or in vaults.

a. 3-in and smaller - threaded ends

b. 4-in and larger flanged ends.

G. Provide all special adaptors as required to ensure compatibility between valves, appurtenances and adjacent pipe.

H. Valves and actuators located outdoors but not within a building; within maximum 2-ft above liquid; in vaults; or where otherwise noted shall be especially designed for submerged service where water may completely submerge the valve and operator. All other units shall be as a minimum weather tight.

2.02 VALVE ACTUATORS - GENERAL

A. The valve Manufacturer shall supply and integrally, rigidly mount all actuators, including any type of manual or powered actuators, on valves at the factory. The valves and their individual actuators shall be shipped asa unit.

B. Unless otherwise noted, valves shall be manually actuated; nonburied valves shall have an operating wheel, handle or lever mounted on the operator; buried valves and those with operating nuts shall have a non-rising stem with an AWWA 2-in nut. At least two tee handles shall be

provided for all operating nuts.

C. Except as otherwise shown on the Drawings or specified herein, all valves 3-in diameter or larger, with the valve center line located 7-ft or more above the operating floor, shall be provided with chain wheel operators complete with chain guides and hot dipped galvanized steel chain, which loop within 4-ft of the operating floor.

D. All actuators shall be capable of moving the valve from the full open to full close position and in reverse and holding the valve at any position part way between full open or closed.

E. Each operating device shall have cast on it the word “OPEN” and an arrow indicating the direction of operation.

F. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in-place, with fastening top by Clow or equal.

G. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five times the maximum operating torque. Stem adaptors shall be provided.

H. Where required by the installation, or as specified, provide the following: extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient seal around stem penetration of slab.

2.04 GATE VALVES (2-1/2-IN AND SMALLER)

A. Gate valves 2-1/2-in diameter and smaller shall have screwed ends, cast iron body and 4” hand wheel, AVK Model No. 03-090-TTN or Engineer approved equal.

B. All water valves 1-1/2-in unless noted otherwise, shall be brass body gates and shall be Jenkins No. 1240, or Hammond 1B-647.

2.05 Valve Applications:

1. Valves for Non-Potable Water Service:

a. Resilient seat gate valves shall be ductile iron bodied, bronze mounted, with wedge type disk, hand wheel andrubber seat. Valves shall be manufactured in accordance with AWWA C509. Valves shall be suitable for above

ground service, be designed for 150 psi working pressure, shall be of O-ring type, with non-rising stem, and opening counterclockwise. Valves shall have flanged ends. Valves shall be coated in accordance with AWWA C550.

b. Resilient seated design manufactured by American R-B Clow, Mueller, M&H Valve Company or equal.

2. Valves for Wastewater Service (NOT USED)

3. At the CONTRACTOR's option and unless otherwise indicated, any of the listed valve styles may be used, at no additional cost to the OWNER.

A. Valve Requirements:

1. Double Disc (NOT USED)

2. Double Revolving Disc (NOT USED)

3. Solid Wedge (NOT USED)

4. Resilient Seated:

a. Conform to AWWA C509. Also UL and FM approved.

b. Internal and external epoxy coating of valve body, including bonnet, per AWWA C550.

c. Gate shall be encapsulated with synthetic rubber. It shall be bonded and vulcanized in accordance with ASTM B429 Method B.

d. No recesses in valve body.

B. Buried Valves:

1. Conform to the requirements above, except mechanical joint bell ends per AWWA C111. The valve shall be mechanically restrained with Megalug Series 1100 or ENGINEER approved equal. All exposed valve hardware (nuts, bolts, washers, etc.) including bonnet, bonnet cover, stuffing box, gear adaptor and joints shall be Type 304 stainless steel.

2. Non-rising stem design, double o-ring seals for non-geared valves and shall incorporate packing for geared valves.

3. Provide valve box, 2-in operating nut and extension stem and stem cover.

C. Tapping Valves and Sleeves:

1. Tapping valves shall comply with the same requirements as resilient seated gate valves or double revolving disc gate valves except they shall have the flanged end and port opening modified for tapping service. Valves shall be capable of passing a fullnominal sized cutter without damage to the valve. The tapping sleeve shall be gray cast iron or ductile iron mechanical joint type with the outlet flange conforming to MSS-SP-60.

2. All water valves, 4-in and larger, shall be iron body gates, bronze trim, flanged ends, O.S. & Y. pattern, solid wedge, rising spindle, Jenkins No. 651, or Hammond 1R-1140.

2.06 BALL VALVES

A. Ferrous Ball Valves:

1. Ball valves for mainline or water service shall be either ductile iron or carbon steel body, full bore, fire-safe, rated for a line pressure of 150 psig. Except as noted, ball valves shall comply with AWWA C507.

2. The design of the valve shall be such that it shall provide suitable seating in both directions. In order to determine the position of the ball within the valve (open or closed), there shall be an easilyvisible, permanent, indicator located conspicuously on the valve. Ball valves shall have Type 316 stainless steel seating surfaces. Seats shall be Type 304 stainless steel. The fully open port area shall be approximately 100 percent of the nominal pipe area.

3. Valve shafts shall be ground and polished and shall be Type 304 stainless steel. Teflon-lined bearings shall be supplied in both trunnions of the valve body.

4. The valves shall be constructed so that the seals, seats and balls are accessible for replacement without dismantling the piping. The valves shall not require lubrication but shall have stuffing boxes which can be packed with the valve in service without undue leakage. Ball valves shall be as manufactured by Henry Pratt Co., Aurora, IL; Williamette, Portland, or equal.

5. Valve actuators shall conform to AWWA C507 and as specified herein.

B. Ball valves for water piping shall be manual or electric actuated (as shown on the Drawings), bronze, resilient seated, regular port, threaded twopiece bolted body type valves. The body and cap shall be of brass, ASTMB30, the ball and stem of Type 316 stainless steel and the seats and sealsof TFE. The valves shall have full floating ball and shall be non lubricated.Valve seats shall be easily accessible and replaceable. Valves shall be rated to 250 psi and shall be as manufactured by Neles-Jamesbury; WKM or equal.

2.07 CHECK VALVES

A. Swing check valves, sizes 2-1/2 inches through 12 inches shall be spring and lever operated with bronze disc facing and flanged ends with a maximum working pressure of 175 psig and test pressure of 350 psig.

B. Swing check valves, sizes 14 inches through 24 inches shall be spring and lever operated with bronze disc facing and flanged ends with a maximum working pressure of 150 psig and test pressure of 300 psig.

C. Swing check valves, sizes 4 inches and smaller shall use bronze disc ASTM B584.

D. Valves shall meet all applicable parts of ANSI/AWWA C508 Standard.

E. Valves for above grade shall be flanged end. Flanged end dimensions and drilling shall comply with ANSI B16.1, Class 125. Swing check valves for buried service shall be mechanical joint ends.

F. The valve body shall be constructed of ductile or cast iron per ASTM A126, Class B, or ASTM A536, bronze mounted (IBBM).

G. Valves shall be located above grade unless otherwise noted in the Drawings and Specifications.

H. Valves shall have an O-ring sealed stuffing box.

I. Valves shall have adjustable spring tension to control opening and closing of the clapper.

J. Valves shall be installed so that the direction of flow through the valve and the shaft orientation is in accordance with the Manufacturer’s recommendations.

K. Swing check valves specified herein shall be by Mueller Company, Model No. 2600 for above grade installations, or ENGINEER approved equal. All Manufacturers, named or otherwise, must comply completely with the

specification.

2.08 INSULATING FITTINGS

Fittings shall be of type to provide control of electrolysis and equal to “Dielectric” as manufactured by Watts Regulator Co., or equal.

2.09 SURFACE PREPARATION AND SHOP COATINGS

A. Not withstanding any of these Specifications, all coatings and lubricants in contact with non-potable water shall be certified as acceptable for use with that fluid.

B. In case of a conflict, the requirements of this Section govern.

C. If the Manufacturer’s requirement is not to require finished coating on any interior surfaces, then Manufacturer shall so state and no interior finish coating will be required, if acceptable to the ENGINEER.

D. The exterior surface of various parts of valves, operators, floor-stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with the instructions of the paint Manufacturer or other primer compatible with the finish coat provided.

E. Unless otherwise noted, interior ferrous surfaces of all valves shall be given a shop finish of an asphalt varnish conforming to AWWA C509, (except mounting faces/surfaces) or epoxy AWWA C550 with a minimum thickness of 4 mil.

F. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.

G. Mounting surfaces shall be especially coated with a rust preventative.

H. Special care shall be taken to protect uncoated items and plastic items, especially from environmental damage.

2.10 FACTORY INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. Factory inspection, testing and correction of deficiencies shall be done in accordance with the referenced Standards and as noted herein.

B. See Division 1 for additional requirements. Also refer to Part 1 of this Section, especially for required submission of test data to the ENGINEER.

C. In addition to all tests required by the referenced Standards, the following shall also be factory tested:

1. Pressure regulating valves shall be factory tested at the specified pressures and flows.

2. The non-cavitating butterfly valves, to demonstrate its non-cavitating capabilities.

3. All types of air and vacuum valves.

2.11 VALVE BOXES

A. Valve boxes shall be provided for all buried valves.

B. Valve boxes shall consist of cast iron base and adjustable top section with cover, which shall be marked “Water, Sewer, or Reuse.”

C. Cast iron extensions shall be provided as required to meet grade.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. All valves and appurtenances shall be installed per the Manufacturer’s instructions in the locations shown, true to alignment and rigidlysupported.

B. Any damage to the above items shall be repaired to the satisfaction of the ENGINEER before they are installed.

C. Install all brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings, or otherwise required.

D. Before setting these items, the CONTRACTOR shall check all Drawings and figures which have a direct bearing on their location.

E. The CONTRACTOR shall be responsible for the proper location of valves and appurtenances during the construction of the Work.

F. All materials shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc.

G. All valve flange covers shall remain in place until connected piping is in place.

H. All operating mechanisms shall be operated to check their proper functioning and all nuts and bolts checked for tightness.

I. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the OWNER.

J. Where installation is covered by a Referenced Standard, installation shall be in accordance with that Standard, except as herein modified, and the CONTRACTOR shall certify such. Also note additional requirements in other parts of this Specification.

K. Unless otherwise noted, joints for valves and appurtenances shall bemade up utilizing the same procedures as specified under the applicable type connecting pipe joint and all valves and other items shall be installed in the proper position as recommended by the Manufacturer.

L. CONTRACTOR shall be responsible for verifying Manufacturer's torquing requirements for all valves.

3.02 INSTALLATION OF MANUAL OPERATIONAL DEVICES

A. Unless otherwise noted, all operational devices shall be installed with the units of the factory, as shown on the Drawings or as acceptable to the ENGINEER to allow accessibility to operate and maintain the item and to prevent interference with other piping, valves and appurtenances.

B. For manually operated valves 3-inch in diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.

C. Floor boxes, valve boxes, extension stems and low floor stands shall be installed vertically centered over the operating nut, with couplings as required and the elevation of the box top shall be adjusted to conform with the elevation of the finished floor surface or grade at the completion of the Contract.

D. Boxes and stem guides shall be adequately supported during concrete pouring to maintain vertical alignment.

3.03 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. See also Division 1. Take care not to over pressure valves or appurtenances during pipe testing.

B. If any unit proves to be defective, it shall be replaced or repaired to the

satisfaction of the ENGINEER.

C. Functional Test:

1. Prior to plant start-up, all items shall be inspected for proper alignment, quite operation, proper connection and satisfactory performance.

2. All units shall be operated continuously while connected to the attached piping for at least 8 hours, without vibration, jamming, leakage, or overheating and perform the specified function.

D. The various pipe lines in which the valves and appurtenances are to be installed are specified to be field tested.

E. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the ENGINEER.

F. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the ENGINEER.

3.04 IDENTIFICATION OF VALVES

A. All valves shall be designated by distinguishing numbers and/or letters on required chart(s) and/or diagram(s).

B. The CONTRACTOR shall install approved brass tags for all designated items with numbers and/or letters on the tags corresponding to those on the chart(s) and/or diagram(s).

C. Each valve identification tag to be minimum 19 gauge polished brass: 2-inch diameter.

D. Each tag to designate appropriate service (1/4 inch stamped black-filled letters) and appropriate valve number (1/2 inch stamped black-filled number).

E. Tags shall be securely fastened to valves with approved stainless steel screws or rivets, or brass jack chain, in a manner to permit easy reading.

F. CONTRACTOR shall prepare piping flow diagrams (or re-use those on the contract plans) indicating valve numbers, service, normal position, etc., of each valve.

G. Diagrams shall be mounted on an ornamental iron frame with hinged

plexiglass face for wall mounting. Four (4) frames with plexiglass are required.

H. The requirements for valve identification specified above applies equally to all valves installed under this and under other sections of these specifications.

3.05 CLEANING

All items (including valve interiors) shall be cleaned prior to installation, testing, disinfection and final acceptance.

3.06 DISINFECTION

Disinfection of valves and appurtenances shall be in accordance with AWWA Requirements.

3.07 SETTING VALVES AND BOXES

A. Valves and valve boxes as specified in the preceding paragraphs shall be installed where shown on the drawings unless otherwise directed.

B. Valves shall be set plumb with the base of the valve box centered over the valve and resting on compacted backfill.

C. The top section of the box shall be set to allow equal movement above and below finished grade.

D. After being correctly positioned, fill shall be carefully tamped around the valve box for a distance of 4-feet on all sides of the box.

E. In paved areas, top of the cover shall be flush with the finished paving.

F. In off-street areas, the cover shall be set 1-inch above existing grade unless otherwise directed by the ENGINEER and a concrete pad shall be poured around the tope of the box as shown in the standard details.

END OF SECTION 151010

SECTION 151100
DIRECTIONAL BORES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The extent of directional boring is shown on the Drawings.

B. The work included in this section covers the installation of carrier pipe by the directional boring (trenchless installation) method as described herein, within the limits indicated on the Drawings. In general, include the following:

1. Bore pit.

2. Pilot hole (as required).

3. Drilling fluids.

4. Carrier pipe.

5. Removal and disposal of drilling fluids and soil cuttings.

6. Soil reports as required by jurisdictional agencies beyond those already provided by the OWNER.

7. Siltation and sediment control.

8. All other work required to install the carrier pipe as specified herein and as shown on the drawings.

C. The CONTRACTOR will furnish all labor, equipment, materials, and supplies as well as will perform all work necessary to provide the OWNER with complete, finished reclaimed water and sewer force main crossing via horizontal directional drilling.

D. The proposed alignment length, to which the sewer force main shall be installed are noted on the applicable Drawings.

1.02 DESIGN/PERFORMANCE REQUIREMENTS

A. Provide design engineering for the work as described in Paragraph 1.2 and as described herein and on the Drawings, including, but not limited to, the following elements:

1. Bore hole diameter and length.

2. Location of borehole entry and exit points.

3. Drilling procedures.

4. Pipeline pulling operations.

5. Method of drilling fluid disposal.

6. Area required for drilling operations and storage of pipe.

7. Drilling fluids management plan.

8. Review of plan drawings and proposed horizontal and vertical alignment of the pipeline, with written certification of agreement with them, or recommended departure from them. Note the minimum depth of the force main shall comply with that indicated in the details, and shall not exceed four (4) feet unless indicated otherwise.

B. The CONTRACTOR's submitted design shall be signed and sealed by a Professional Engineer whose specialty includes design of horizontal drilling operations. The cost of these engineering services will be included in the Bid Price.

C. The CONTRACTOR shall be responsible for conducting the job in accordance with all applicable federal, state, and local permits, codes and statutes.

1.03 SUBMITTALS

A. Drawings:

1. Working drawings showing in detail the size and location of boring pits together with all sheeting and shoring to be used in supporting embankments and trench walls, and any other details of the proposed methods of installation required to allow adequate review by the ENGINEER.

2. The CONTRACTOR shall prepare a drilling plan indicating equipment proposed for each location, pull-back forces anticipated and shall verify that the DR of the pipe specified is adequate to withstand the anticipated pull-back forces in addition to the earth, line, and groundwater loads.

B. Shop Drawings:

1. Submittal shall include, but not be limited to, elements listed in Paragraph 1.02 - Design/Performance Requirements above.

C. Task Schedule:

1. Detailed schedule of tasks for each stage or operation involved in the work of this section.

2. Include as a minimum the following major tasks:

a) Preparatory earthwork operations.

b) Drilling rig mobilization and set-up.

c) Pipe delivery and on-site pipe joining operations.

d) Pilot hole drilling and reaming operations.

e) Pipeline pulling operations.

f) Pipeline hydrostatic testing.

g) Drilling fluid disposal.

h) Restoration and demobilization.

3. Task Schedule shall conform to contract schedule as outlined in the General Provisions.

D. As-Builts:

1. On completion of the pilot-hole phase of each drill site, a complete set of “as-built” records shall be submitted in duplicate to the ENGINEER.

2. These records shall include copies of the plan and profile drawing, as well as directional survey reports as recorded during the drilling operation.

3. Upon completion drawings shall be submitted to the ENGINEER in AutoCAD® 2018 file format.

E. Technical Data:

1. Equipment to be utilized on the project

2. Prior to approval, submit the names of supervisory field personnel and historical information of directional boring experience.

F. Material Safety Data Sheets (MSDS):

1. MSDS information for the drilling slurry compounds.

G. Disposal Plan:

1. The plan shall describe the CONTRACTOR's plans for disposal of the drilling fluid and the names, addresses, and telephone numbers of any and all subcontractors who will be performing any portion of the disposal activities.

2. At a minimum the plan shall include:

a) Disposal method.

b) Disposal hauler(s).

c) Disposal locations.

d) Estimated quantity to be disposed.

e) Type of vehicle hauling drilling fluids

f) Signed statement that all hauling equipment (i.e., vehicle, tanker, dump truck, trailer, etc.) meets all requirements of state agencies.

g) Letter from proposed disposal site(s) accepting material.

H. Erosion Control Plan:

1. The erosion control plan shall be submitted for approval 10 days prior to commencement.

2. It shall be a written, detailed plan for the accomplishment of acceptable erosion control on the project.

3. The plan shall describe all necessary temporary measures to be implemented for preventing soil erosion from the construction site until permanent erosion control and finished surfaces are installed.

4. The plan shall comply with all state and local requirements.

I. Pipe Connection Procedures:

1. The CONTRACTOR shall submit pipe connection procedures to the ENGINEER prior to connecting any pipe.

2. For plastic (HDPE) pipe, the CONTRACTOR shall submit the pipe manufacturer's representative's written approval of his procedures.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport on commercial carriers.

B. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer.

C. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations and the requirements of this specification.

D. Deliver and store materials within limits of rights-of-way and/or property lines as shown on the Drawings or as directed by the OWNER.

E. The CONTRACTOR shall be responsible for securing all project materials and shall bear the cost of replacing any materials which may become misplaced or stolen.

1.05 JOB CONDITIONS

A. The CONTRACTOR shall be held fully responsible for protecting against surface subsidence, damage, or disturbance of adjacent property and facilities from his construction methods.

B. A superintendent and/or engineer experienced in directional boring methods and techniques, and who represents the boring contractor, shall be present at all times while work is proceeding. He shall also be responsible for the frequent checking of line and grade, if needed. Tolerances should be agreed to in the light gradient and easement requirements.

C. The CONTRACTOR shall be held responsible for the coordination and scheduling of all construction work.

1.06 SAFETY

A. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current.

B. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.

C. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.

D. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

PART 2 - PRODUCTS

2.9 MATERIALS

A. Drilling fluid shall be a gel-forming colloidal fluid consisting of at least 10% of high-grade bentonite, which is totally inert and contains no environmental risk, or equal.

B. Carrier Pipe:

1. Pipe shall be as specified in Section 15070 HDPE pipe.

2.10 EQUIPMENT

A. Directional Drilling Equipment:

1. General:

The directional drilling equipment shall consist of:

a. Directional drilling rig of sufficient capacity to perform the bore and pull back the pipe.

b. Drilling fluid mixing.

c. Delivery and recovery system of sufficient capacity to successfully complete the installation.

d. Drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required).

e. Magnetic guidance system or walk over system to accurately guide boring operations.

f. Vacuum truck of sufficient capacity to handle the drilling fluid volume.

g. Trained and competent personnel to operate the system.

h. All equipment shall be in good, safe condition with sufficient supplies, materials, and spare parts on hand to maintain the system in good working order for the duration of this project.

2. Drilling Rig:

a. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid

mixture to a guidable drill (bore) head.

b. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation.

c. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations.

d. The hydraulic system shall be free of leaks.

e. The rig shall have a system to monitor and record maximum pullback pressure during pullback operations.

f. A system should be in place to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.

3. Drill Head:

The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.

4. Guidance System:

a. General:

1) An electronic walkover tracking system or a Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation.

2) The guidance system shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock.

3) The guidance system shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction).

4) The guidance system shall be accurate and calibrated to manufacturer’s specifications of the vertical depth of the borehole at sensing position at depths up to 50 feet and accurate to 2 feet horizontally.

b. Components:

The CONTRACTOR shall supply all components and materials to install, operate, and maintain the guidance system.

c. Operation:

1) The guidance system shall be of a proven type, and shall be set up and operated by personnel trained and experienced with the system. The operator shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

2.11 JOINING METHODS

A. Butt fusion joining:

1. Plain end pipe and fittings shall be made using butt fusion.

2. The butt fusion procedures shall be in accordance with the manufacturer or the PPI.

3. Fusion beads shall not be removed.

PART 3 - EXECUTION

3.01 EXECUTION

A. The CONTRACTOR shall be responsible for setting all grade stakes, lines, and levels. The utility bore depth will equal or exceed 10 times the bore size.

B. The CONTRACTOR will coordinate locations of underground utilities with appropriate companies.

C. The CONTRACTOR will advise the ENGINEER immediately if conflict exists.

D. The CONTRACTOR shall operate and maintain all equipment as required to keep the work free from excessive spoil and environmental risks.

E. The CONTRACTOR shall install siltation fences, sediment barriers, etc., as required or shown on the CONTRACTOR's Erosion Control Plan Drawings.

F. The CONTRACTOR shall perform the necessary general earthwork operations as required for the directional drilling and pipe pulling operations.

G. The CONTRACTOR shall be responsible for restoring all areas impacted by the CONTRACTOR's work effort to pre-work conditions.

H. The CONTRACTOR shall be responsible for constructing all means of

temporary access to the designated work sites and shall be liable for all damages caused as a result of the work.

3.02 INSTALLATION

A. Installation shall be in a trenchless manner producing continuous bores.

B. The entry point shall be where shown on the plan submitted as required in 1.2 above. No exception to this requirement will be allowed.

C. The exit point for the drilled hole shall be within 10 feet laterally and within 20 feet longitudinally of where shown on the plan submitted as required in 1.2 above. No exception to this requirement will be allowed.

D. Tunneling System:

1. The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location.

2. Tunneling must be performed by a fluid-cutting process (high pressure-low volume) utilizing a liquid clay, i.e., bentonite.

3. The clay lining will maintain tunnel stability and provide lubrication in order to reduce frictional drag while the pipe is being installed.

4. In addition, the clay fluid must be totally inert and contain no environmental risk.

E. Vacuum Spoils Recovery:

1. The CONTRACTOR must also have a mobile vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits.

2. The spoils must then be transported from the job site and be properly disposed of.

3. Under no circumstances will the drilling spoils be permitted to be disposed of into sanitary, storm, or other public or private drainage systems.

F. Mechanical, pneumatic, or water-jetting methods will be considered unacceptable due to the possibility of surface subsidence.

G. Reamer:

1. After an initial bore has been completed, a reamer will be installed at the termination pit and the pipe will be pulled back to the starting pit.

2. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel.

H. The CONTRACTOR shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits.

I. Environmental Protection:

1. The CONTRACTOR shall place a silt fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection necessary by documents, state, federal and local regulations.

2. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures.

3. Fuel may not be stored in bulk containers within 200 feet of any water body or wetland.

J. Recorded Readings:

1. Readings shall be recorded after advancement of each successive drill pipe, (no more than 15 feet) and the readings plotted on a scaled drawing of 1inch equals 5 feet (1” = 5’), both vertical and horizontal.

2. Access to all recorded readings and plan and profile information shall be made available to the ENGINEER, or his representative, at all times.

3. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.

K. Drilling Fluid Additives and Mixtures:

1. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways.

2. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the CONTRACTOR at an approved dumpsite.

L. Pilot Hole Drilling Operations:

1. The pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100 feet.

2. In the event that pilot does deviate from the bore path more than 5 feet of depth in 100 feet, the CONTRACTOR will notify the ENGINEER and the ENGINEER may require the CONTRACTOR to pullback and re-drill from the location along bore path before the deviation.

3. In the event that a drilling fluid fractures, inadvertent returns or returns loss occurs during pilot hole drilling operations, the CONTRACTOR shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and wait another 30 minutes.

4. If mud fracture or returns loss continues, the CONTRACTOR will discuss additional options with the ENGINEER and work will then proceed accordingly.

M. MJ Adapter Installation:

1. MJ Adapters shall be attached to pipe and fittings using butt fusion.

2. MJ adapters shall be aligned and centered relative to the pipe.

3. MJ adapters should be square with the valve or other flange before tightening of bolts.

4. Bolts should not be used to draw flanges into alignment.

5. Bolt threads shall be lubricated, and flat washers shall be used under flange nuts.

6. Bolts shall be tightened using a “star tightening pattern.” See manufactures recommendations.

7. Twenty-four hours after first tightening the flange bolts, re-tighten the flange bolts using the same “star tightening patter” used above.

8. The final tightening torque shall be as indicated by the manufacturer.

N. Socket and saddle fusions shall be tested by a bent strap test as described by the pipe manufacturer. The pipe manufacturer shall provide visual guidelines for inspecting the butt, saddle and socket fusions joints.

O. The CONTRACTOR shall be liable for retrieving or sealing any pipe that becomes lodged in the drill hole.

3.03 PIPE PULLING OPERATIONS

A. The full length of the pipe to be installed shall be laid out, welded, and tested in one complete unit before being pulled back through the drilled hole. Once started, pipeline pullback shall be continuous unless approved otherwise in writing by the OWNER or the OWNER's designated representative.

B. The pulling head shall be designed by the CONTRACTOR to withstand the continuous tensile pull stresses with intermittent sudden occasional surges. The CONTRACTOR shall be responsible for determining the pulling loads.

C. The pipe shall be continuously lubricated with bentonite slurry and the assembled pipeline shall be laid on rollers, or other apparatus, to facilitate pullback and prevent damage to pipe.

D. The CONTRACTOR shall continue pull back until 10 linear feet (minimum) of pipe is above ground for the purpose of pipe inspection.

E. A blind flange shall be bolted to the fusion welded flange and the pipe shall be marked and buried with a minimum cover of 36 inches.

1. Connections, which will be made under another contract, will require the removal of the blind flange and a flanged ductile iron adapter shall be bolted to the fusion welded flange suitable for the transitional material.

2. The CONTRACTOR shall provide restrained joints or megalug joint restraint as required.

3.04 TESTING

A. In addition to the water system testing requirements specified for the entire system, the CONTRACTOR shall conduct a low-pressure air test of the HDPE sewer force main above ground prior to pullback as follows:

1. Secure and brace ends of pipe to be tested.

2. Provide calibrated low range air pressure gauge on high end of pipe.

3. Fill pipe to maximum pressure of 20.0 psig.

4. Add air as necessary to compensate for internal/external pipe temperature and initial pipe expansion.

5. Check all pipe joints and test fittings with mild soap solution.

6. Repair or replace all leaking joints, pipe and/or fittings.

7. Once air pressure has stabilized, pipe should hold constant air pressure for two hours. If pipe does not hold pressure, check all joints and test fittings with soap solution.

8. Repair or replace sources of leakage and completely retest entire section.

B. In addition to the water system testing requirements specified for the entire system, the CONTRACTOR shall conduct a hydrostatic test of the HDPE sewer force main in-ground after pullback as follows:

1. The HDPE main shall be flushed with potable water to remove any sediment, solids and/or foreign material prior to any in place testing. .

2. Fill the pipe with potable water and after all free air is removed from the test section.

3. Raise the pressure at a steady rate to the required pressure.

4. Measure the pressure in the section with calibrated pressure gauges at each end of the pipe section.

5. Test pressure shall be 150 psi. The initial pressure test shall be applied and allowed to stand without makeup water for a sufficient time to allow for diametric expansion or pipe stretching for stabilization. This usually occurs within 2 to 3 hours. After this equilibrium period, the test section can be returned to 150 psi operating pressure, the pump turned off, and a final test pressure held for 3 hours.

6. Furnish the ENGINEER or Inspector the results immediately following the pressure test.

7. Remove, fill with concrete, or otherwise place out of service all leaking pipes that cannot be repaired to meet pressure test.

3.05 DAMAGED OR IMPROPERLY INSTALLED PIPE

A. If the pipe is damaged before installation, or does not meet the specifications, it shall be replaced at no expense to the OWNER.

B. If the pipe is damaged during installation by the CONTRACTOR's operations, placed at the improper grade or line, or cannot be advanced because of an unseen obstruction or any other reason, it shall, at the discretion of the ENGINEER, be retrieved or abandoned in place and the void filled with concrete by pressure grouting as soon as possible.

C. If it becomes necessary to drill another hole, an alternate installation shall be made as directed by the ENGINEER.

D. The CONTRACTOR shall re-drill the hole and furnish all additional labor and materials required to complete the job as indicated on the plans and specifications at no additional cost to the OWNER.

E. The cost for retrieval or abandonment of pipe shall be at the expense of the CONTRACTOR. No additional payment shall be made for pipe which is retrieved, abandoned, or damaged beyond use, including dewatering, excavation, drilling, backfilling, etc.

F. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed.

G. The undamaged portions of the pipe shall be rejoined using one of the joining methods allowed in the Section.

END OF SECTION
151100

SECTION 221116 - DOMESTIC WATER SYSTEM

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 All materials and installations of this section shall comply with Chapter 6, Water Supplyand Distribution, of the 2010 Florida Building Code – Plumbing.

PART II - PRODUCTS

2.01 PIPING

A) Underground hot and cold water piping - Type K copper with wroughtcopper fittings.

B) Above ground hot and cold water piping - Type L copper with wrought copper fittings.

2.02 REDUCED PRESSURE BACKFLOW PREVENTERS

A) Provide Watts or approved equal, reduced pressure backflow preventers as indicated.

2.03 INSULATION

A) Insulate water piping in accordance with Section 230713.

PART III - EXECUTION

3.01 UTILITIES AND BACKFILLING - Perform work in accordance with Section 230001.

3.02 INTERIOR PIPING

A) Distribute water to equipment and fixtures requiring water service, and as indicated.

B) Make connections to risers, fixtures and equipment from top of mains to permit completedrainage of piping system.

C) Pitch mains toward drain valves. Install drain valves in accessible low points to permit

complete drainage.

D) Install valves indicated and where necessary for proper control of equipment and fixtures.Equip branches and risers with shut-off valves. Provide access doors where required.

E)Pipe sizes for water connections are as follows:

FIXTURES	C.W.	H.W.
URINALS	3/4"	
WATER CLOSETS		
FLUSH VALVES	1"	
FLUSH TANKS	1/2"	
WALL HYDRANTS	3/4"	
LAVATORIES	1/2"	1/2"
SINKS	1/2"	1/2"

F) PIPE JOINTING - Copper piping: Make sweated joints with solder flux and 95-5 solderbetween pipe and fittings. Solder or flux used on domestic water system is to be lead-free.

G) TESTS

1. Before testing, remove equipment having a rating of less than 150 psi, and reinstall suchequipment when testing is complete and satisfactory.

2. Test domestic water system at 150 psi. Maintain pressure for twelve (12) hours. Whilesystem is under pressure, inspect for leaks. Repair leaks found by replacing defective fittings, joints and pipe. NO caulking is permitted. Repair and retest until leaks are stopped. Provide certified reports that all piping has been tested.

H) DISINFECTION - Flush out entire system.

1. Introduce chlorine or a solution of calcium hypochlorite or sodium hypochlorite. Fill linesslowly and apply agent at rate which will produce 50 parts per million of chlorine as determined by residual chlorine tests at end of lines. Open and close valves and hydrants while system is being chlorinated.

2. After 24 hours, test for residual chlorine. If more than 5 ppm are present, flush out systemuntil all traces are removed.

3. After disinfecting, flush treated water from system through its extremities. Continue

flushing until samples of water are satisfactory to local authorities having jurisdiction. Repeat flushing if samples taken daily over next three (3) days indicate that quality of water is not being maintained. Do not draw samples from hydrants and unsterilized hoses.

4. Water samples from the disinfected domestic water system is to be tested by the Local Health Department. Approval by the Local Health Department must be obtained beforethe system is put into service.

END OF SECTION 221116

SECTION 221316 - SOIL AND WASTE SYSTEM PLUMBING

PART I - GENERAL

1.01 THE GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 LIMITS - Work specified here includes soil, waste, and vent piping within building and to apoint 5'-0" outside of building.

PART II - PRODUCTS

2.01 WASTE PIPING - No-hub cast iron or Schedule 40, DWV-PVC pipe and fittings where code permits. Specifically use cast iron pipe where waste or water drains through pipes above oradjacent to occupied areas, or any area where the drainage system would receive waste at temperatures above 130 deg. F.

2.02 CONDENSATE PIPING - Type "M" copper and standard fittings, or Schedule

40 PVC.

PART III - EXECUTION

3.01 UTILITIES EXCAVATING AND BACKFILLING - Perform work in accord with UtilitiesExcavating and Backfilling Section 230001.

3.02 JOINTS - Make joints in PVC with approved cleaning solvent and glue. Make joints gas and water-tight. Use Cast Iron Institute approved no-hub coupling for no-hub pipe and fittings.

3.03 CLEANOUTS - Install per guidelines of manufacturer. For installation in special finishesfor wells and floors and heavy duty applications, verify materials and finishes with designer.

A) WALL CLEANOUT - Dura-Coated cast iron body, gas and watertight ABS tapered threadplug, and round, smooth stainless steel cover with securing screw equal to Zurn Z-1441.

B) FLOOR CLEANOUT - Adjustable Dura-Coated cast iron body, with gas and watertight ABStapered thread plug, and round scoriated top that is adjustable to finished floor equal to Zurn ZN-1400 Level-trol with Polished Nickel Bronze Top.

C) EXTERIOR CLEANOUT - Heavy duty Dura-Coated cast iron body, with gas and watertightABS tapered thread plug, and round heavy duty top adjustable to a finish elevation equal to ZurnZ-1400 Level-trol with Dura-Coated Cast Iron Top.

3.04 FITTINGS - Make changes in pipe sizes with reducing fittings and recessed reducers.

Do not reduce line size in direction of flow.

A) Use Y fittings and 1/8 bends for connecting branch lines for fixtures and vertical runs ofpipe. Use long turn fittings wherever conditions permit.

3.05 VENTS - Run vent stacks as indicated and extend at least one foot above roof. Use full sized pipe for extension through roof. Use no vents smaller than 2" diameter. Do not place ventstacks within 15'-0" of any opening window or door. Coordinate location of stacks with rooftopAC equipment or outside air intakes.

A) Make offsets full size and at angle of not more than 45 degrees.

B) Pitch horizontal runs at least 1/4" per foot.

C) Where practical, and permitted by code, two or more vent lines may be connected and extended through roof as one line when properly sized. Vertical vent pipes may be connectedinto one main vent riser above fixtures vented.

D) Where an end circuit vent pipe for any fixture or line of fixtures is to be connected to a ventline serving other fixtures, extend vent pipe at least 3'-6" above floor on which fixtures are located before connecting or method approved by roofing manufacturer.

E) Provide 4 lb. lead flashing or other method approved by roofing manufacturer for ventspenetrating roof.

3.06 TESTS - Subject drainage and vent system to a test of at least 10'-0" of hydrostatic head. Stop all openings in system except those at roof vents and fill system with water. Hold water insystem until all joints have been checked for visible leakage and for minimum of 30 minutes. Replace any defective fittings and piping. Repair leaks and re-test until all leaks are stopped.

A) Secure final inspection report and approval from local plumbing inspector.

B) Install complete system to meet applicable codes and local code authority.

END OF SECTION 221316

SECTION 223400 - DOMESTIC WATER HEATERS

PART I - GENERAL

1.01 ALL GENERAL CONDITIONS and SPECIAL CONDITIONS bound with these CONTRACT DOCUMENTS are considered included herein and are to be adhered to as if boundwithin.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 REFERENCES:

A) ANSI/ASME Section 8D - Pressure Vessels.

B) ANSI/NFPA 30 Flammable and Combustible Liquids Code.

C) ANSI/NFPA 54 - National Fuel Gas Code.

D) ANSI/NFPA 70 - National Electrical Code.

E) ANSI-UL 1453 – Electric Booster and Commercial Storage Tank Water Heaters.

F) UL 174 – Household Electric Storage Tank Water Heaters.

G) ASHRAE 90.1-2004.

2.02 QUALITY ASSURANCE:

A) Ensure products and installation of specified products are in conformance withrecommendations and requirements of the following organizations:

1. American Gas Association (AGA).
2. National Sanitation Foundation (NSF).
3. American Society of Mechanical Engineers (ASME).
4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
5. National Electrical Manufacturers Association (NEMA).
6. Underwriters Laboratories (UL).

7. Chapter 5, Water Heaters, Florida Building Code – Plumbing.

2.03 REGULATORY REQUIREMENTS:

A) Conform to AGA, NSF, MBBPVI, ANSI/NFPA 54, and ANSI/NFP 70, requirements forwater heaters.

B) Conform to ANSI/ASME Section 8D for tanks.

C) Installation of water heater shall conform to requirements of applicable plumbing, gas and/orelectrical codes.

2.04 SUBMITTALS:

A) Include dimension drawings of water heaters indicating components and connections to otherequipment and piping.

2.05 OPERATION AND MAINTENANCE DATA:

A) Include operation, maintenance, and inspection data, replacement part numbers andavailability, and service depot location and telephone number.

2.06 DELIVERY, STORAGE, AND HANDLING:

A) Deliver products to site described under general provisions of specifications.

B) Store and protect products described under general provisions of specifications.

C) Provide temporary inlet and outlet caps. Maintain caps in place until installation.

2.07 WARRANTY:

A) Provide five year manufacturer's warranty.

2.08 ACCEPTABLE MANUFACTURERS - WATER HEATERS:

A) The water heater shall be as shown on the drawings or acceptable equivalent by Lochinvar,State Industries or Rheem. Any other product shall be submitted to the Engineer for written approval no later than 10 days prior to bid date.

2.09 INSTANTANEOUS WATER HEATERS

A) A Piezo-electric ignition is used to ignite the pilot burner.

B) Unit is to be equipped with a pilot burner shut-off device. When the pilot is out, the mainburner and the pilot burner gas valve are automatically turned off a combination control to prevent escape of unburned gas.

C) The heat exchanger is to be pure copper, coated with lead; Chrome stainless steel burners,Copper piping, Brass controls and fittings. The outer cover is to be porcelain enameled.

D) Unit is to have a modulating control, which automatically adjust the flame to the water flow selected. Minimum operating water pressure is designed for satisfactory service with inlet waterpressure as low as 2.4 psi.

E) There is to be a dial setting to select the temperature rise ranging from 60 deg. F to 100 deg.F.

PART III - EXECUTION

3.01 WATER HEATER INSTALLATION

A) Install water heaters in accordance with manufacturer's instructions and to AGA, NSF,NFPA, and UL requirements.

B) Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION 223400

SECTION 224213.13 - PLUMBING FIXTURES AND TRIM

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 PLUMBING FIXTURES: American Standard, Kohler, Briggs or equivalent. See Fixture Schedule on drawing. Wall hung lavatories, if included in the Fixture Schedule, are to be furnished complete with wall mounting brackets. Fixtures shall be white unless shown otherwisein Fixture Schedule.

2.02 ROOF DRAINS, HYDRANTS, FLOOR DRAINS, SHOCK ABSORBERS, CARRIERS,TRAPS:
Josam, Zurn or equivalent. Fixtures shall be mounted rigid to walls as shown on drawings and/ordetails. Floor drains in public toilet rooms are to be deep trap type.

2.03 FLUSH VALVES: Delaney, Sloan Royal or Zurn.

2.04 TOILET SEATS: Olsonite, Beneke, Bemis, or Church.

2.05 FAUCETS: American Standard, Zurn, Symmons or approved equivalent.

2.06 STOPS: Zurn, McGuire or approved equivalent.

2.07 SINKS: Just, Elkay, Dayton or approved equivalent for stainless steel sinks. SternWilliams, Fiat or approved equivalent for laundry and mop sinks.

PART III - EXECUTION

3.01 All fixtures shown on architectural drawings shall be furnished and installed under thisDivision, whether or not shown on the plumbing drawings.

3.02 Contractor shall furnish and install outlet devices which limit the flow of hot water to lavatories and sinks, to a maximum of 0.5 G.P.M. as manufactured by Dole Flow Control's Company, or equivalent, sized as recommended by manufacturer, as required under ASHRAEStandard 90-75 paragraph 7.7.2 and Florida Plumbing Code.

3.03 Contractor shall caulk around all joints at fixtures mounted on wall or floor, or backed up towalls. Caulking shall be General Electric silicon sanitary sealant, or equivalent.

3.04 Contractor is to verify that all dimensions of installed fixtures will fit in allowed space.Coordinate dimensions of fixtures with cabinetry details and/or existing cabinet work.

3.05 Contractor is to provide manufactured wrap for hand sinks with handicapped access, equalto Truebro or Plumberex Specialty Products.

END OF SECTION 224213.13

SECTION - 230000 - GENERAL MECHANICAL REQUIREMENTS

PART I - GENERAL

1.01 ALL GENERAL CONDITIONS and SPECIAL CONDITIONS bound with these CONTRACT DOCUMENTS are considered included herein and are to be adhered to as if boundwithin.

1.02 The intent is to obtain a complete installation to which end the contractor shall provide allmaterial, equipment, labor, etc., specified and/or shown by schedule on the plans, and any otheraccessories which may not be specified but which are normally furnished and can be reasonablyimplied from the specifications or plans. This contractor shall furnish all freight, drayage, rigging, etc., required for his work.

1.03 In this division, the word "provide" means to furnish, install and connect. The word "contractor", or "this contractor", means the contractor engaged to execute that portion of the work under which the word is shown. The word "work" means the portion of the project normally and historically attributed to the Mechanical Contractor, and designated as being in thisDivision. The word "Designer" means the prime design professional identified in the Bidding Documents and Agreement Form for the project. The term "Owner" means the owner or his authorized representative. The term "tradesmen" means the person or persons employed by the contractor, either directly or indirectly, who is skilled in the work area being contracted.

1.04 Review all of the "Contract Documents" and each of the Divisions of the complete specifications and ascertain that all of the requirements and coordination resulting therefrom areincluded before submitting a bid for this Divisions work.

1.05 The right is reserved to relocate any item as much as 5 feet without additional chargeprovided the contractor is notified before the work in question is started.

1.06 Refer to all drawings for dimensions and large scale details before locating items provided.Do not scale drawings having 1/4" or smaller scale, as it is not possible for them to show all offsets or accessories needed for a complete installation. Provide these offsets and accessories asrequired.

1.07 The complete installation shall comply with all applicable laws, ordinances, utility regulations, and authorities having jurisdiction. When a conflict between the plans and code orstandard occur, the more stringent will apply.

1.08 Work is to be performed to meet the minimum requirements of the standards referenced inthese specifications, and are as follows:

1. AGA - AMERICAN GAS ASSOCIATION
2. AMCA - AIR MOVEMENT AND CONTROL ASSOCIATION, INC.
3. ANSI - AMERICAN NATIONAL STANDARD INSTITUTE
4. API - AMERICAN PETROLEUM INSTITUTE

5. ARI - AMERICAN REFRIGERATION INSTITUTE
6. ASHRAE - AMERICAN SOCIETY OF HEATING, REFRIGERATING &AIR CONDITIONING ENGINEERS
7. ASME - AMERICAN SOCIETY OF MECHANICAL ENGINEERS
8. ASTM - AMERICAN SOCIETY OF TESTING MATERIALS
9. AWWA - AMERICAN WATER WORKS ASSOCIATION
10. FM - ASSOCIATION OF FACTORY MUTUAL FIRE INSURANCECOMPANY
11. IRI - INDUSTRIAL RISK INSURANCE
12. NEC - NATIONAL ELECTRICAL CODE
13. NEMA - NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
14. NFPA - NATIONAL FIRE PROTECTION ASSOCIATION
15. NSF - NATIONAL SANITARY FOUNDATION
16. PDI - PLUMBING DRAINAGE INSTITUTE
17. FBC - FLORIDA BUILDING CODE 2020
18. FBC - FLORIDA BUILDING CODE 2020 FUEL GAS
19. FBC - FLORIDA BUILDING CODE 2020 PLUMBING
20. FBC - FLORIDA BUILDING CODE 2020 MECHANICAL
21. FBC - FLORIDA BUILDING CODE 2020 ENERGY
22. SMACNA - SHEET METAL & AIR COND. CONTR. NATL. ASSOC.
23. STATE OCCUPATIONAL SAFETY & HEALTH ACT
24. UL - UNDERWRITERS LABORATORIES

1.09 MANUFACTURER'S RECOMMENDATIONS - All products specified or indicated are tobe installed in accordance with manufacturer's recommendations. Provide a copy of those recommendations at the job site for use of installers, Designer, and Owner's representative.

PART II - PROTECTION

2.01 Store materials off of ground, and protect against damage. If storage area is not weathertight, cover materials in such a way as to avoid wetting while allowing for air circulation.

2.02 Protect polished and plated parts with a heavy coat of petroleum jelly. Keep covered untilitems are given final cleaning.

2.03 Protect equipment outlets and pipe openings with plugs or caps. Do not use wood, paper,or rags.

PART III - RELATED WORK SPECIFIED IN OTHER SECTION:

3.01 ELECTRIC POWER: Power and control wiring - DIVISION 26 - ELECTRICAL.

3.02 CONCRETE: All formed, poured concrete is specified in DIVISION 3.
Any rough poured concrete, i.e. "Kickers", manhole bases, etc., will be furnished by this division, including any required reinforcing; furnish all anchors and bolts required by this trade.

3.03 PAINTING: Except as specified in DIVISION 23, painting is specified in DIVISION 9.

PART IV - ITEMS TO BE FURNISHED FOR INSTALLATION BY OTHER TRADES:

4.01 MOTOR STARTERS: Electrical thermostats, controls and devices; installation is specifiedin DIVISION 23.

4.02 ACCESS DOORS

4.03 CONNECTING AND ROUGH-IN FOR EQUIPMENT

A) Where drawings or specifications indicate items furnished by other trades are to be connected to mechanical items, provide piping, valves, miscellaneous fittings, and appurtenancesfor proper connection.

B) Where drawings indicate utilities for Owner furnished equipment, and equipment markedN.I.C., provide piping, valves, miscellaneous fittings, and appurtenances up to points of termination. Terminate utilities with caps, plugs and valves indicated for convenient final connection. When Owner furnished equipment is set in place, make final connection.

4.04 PERMITS AND CERTIFICATES: Obtain and pay for applicable permits and certificatesof inspection for work specified in DIVISION 23.

PART V - INSTRUCTIONS, BROCHURES, AND AS-BUILT DRAWINGS:

5.01 When work is completed and building is officially turned over to Owner, have a qualified person fully instruct Owner's representative in care and operation of mechanical systems. NotifyOwner in writing when instructions are completed.

5.02 When building is substantially complete, submit to Designer, for delivery to Owner, three (3) sets of submittal data, shop drawings, operating instructions, and catalog sheets for replacements parts, bound in vinyl cover loose-leaf notebooks. Bind three (3) complete setsseparately, one in each of three (3) notebooks.

5.03 Submit a blue line drawing to Designer, neatly and appropriately marked in pencil to indicate as-built conditions. Locate pipes, ducts, valves and other appurtenances below groundgiving accurate depths and lateral distances from fixed points such as building walls.

5.04 SHOP DRAWINGS AND SUBMITTAL DATA:

A) Submit shop drawings and submittal data specified in DIVISION 23 to Designer. SeeSupplement to General Conditions for number required and submittal requirements.

5.05 Prior to submitting shop drawings, examine submittal data to assure that information is inaccord with contract requirements, and that equipment proposed for

use will fit into space available, considering space for coil removal, filter service, maintenance, and other activities

required to keep equipment operating in proper manner.

5.06 Submittal shall denote in RED all deviations in electrical and/or mechanical arrangement from that specified, including such items as electrical loads, electrical connections and physicalsize. It is understood when submittal is received that all items that affect other trades have beencoordinated with those trades. It is the sole responsibility of the mechanical contractor to coordinate electrical requirements with the electrical contractor. Any electrical data given on drawings is strictly for electrical load estimation only. Contractor shall not assume that the electrical drawings reflect the actual requirements for mechanical equipment.

5.07 At Designer's and/or Engineer's request, the Contractor shall furnish a 1/2" = 1'-0" scaled drawing of equipment room, showing all equipment, with service area for electrical, HVAC, andplumbing, if the equipment, submitted is different than that specified and used for design.

5.08 Submittal data shall include, but is not limited to the following:

A) Arrangement drawings with complete dimensional data.

B) Performance data listing the following:

1. Capacities, CFM, entering and leaving air pressure losses for air and all componentpressure losses.

2. Horse power, K.W., and total unit electrical requirements.

3. Fan curves, discharge arrangement, motor locations, sheaves and belt data.

4. Power and control wiring diagrams, showing interlock requirements.

5. Isolators and isolator location with selection data.

6. Filter data with type, size, number required and pressure drop. (See schedule on drawings.)

5.09 AUXILIARY EQUIPMENT BY OTHER MANUFACTURERS:

A) Furnish name, capacity, dimensions, wiring diagrams and power requirements.

PART VI - PRODUCTS

6.01 ELECTRICAL REQUIREMENTS:

6.02 ELECTRIC MOTORS - Provide electric motors for mechanical equipment.

6.03 MOTORS - NEMA Standard, designed for full speed continuous operation with temperature rise not exceeding rating. Motors which require lubrication shall have grease fittings. Motors shall have thermal overload protection provided for all phases.

All motors to be

NEMA 10 or 11 premium efficiency motors.

6.04 MOTORS 1/2 HP AND LESS - 120/230 single phase/60 Hz AC capacitor start, 40 degreesC continuous rise, open drip-proof type.

6.05 MOTORS OVER 1/2 HP - 230V/460 three phase/60 Hz AC squirrel cage type, NEMAdesign B, open drip proof type, 40 degrees C continuous rise, with ball bearings.

6.06 MOTOR STARTERS:

A) Furnish motor starters for mechanical equipment to electrical trades for installation andwiring. Provide motor starters of one manufacturer, Allen-Bradley, Square D, or equal.

B) Provide starters, with NEMA 1 enclosures, having following features: Thermal overload protection on all phases; either heavy duty, oil-tite, push-button switch momentary contact type,or hand-off-auto selector switch with pilot light in cover, unless otherwise indicated; auxiliary contacts for control interlock plus one spare; engraved nameplates designating motor served.

PART VII - MATERIAL APPROVAL:

7.01 Do not order materials until Designer's approval has been received.

7.02 Capacities, sizes and other conditions indicated and specified are minimums.

7.03 Materials and equipment of same type, classification and purpose shall be products of onemanufacturer.

PART VIII - EXECUTION

8.01 MECHANICAL DRAWINGS: Drawings generally indicate location of machinery, equipment, and related items. Follow drawings as closely as practicable; however, check alldimensions on job site and make any changes necessary to fit structural conditions, other equipment and to avoid conflicts.

8.02 UTILITIES EXCAVATING AND BACKFILLING - Perform this work in accord withUtilities Excavating and Backfilling Section 230001.

8.03 GUARANTEES - Mechanical equipment is included in guarantees established in GeneralConditions and Supplement to General Conditions.

8.04 TESTING AND ADJUSTING - Test, adjust and provide reports as specified in applicablesections of DIVISION 23.

8.05 COORDINATING:

A) Schedule work and coordinate with other trades to avoid delays, interference and

unnecessary work.

B) Furnish information which may be required to revise footing elevations, structural elements,chases, openings in walls, floors, and roof, and to provide clearances to accommodate work.

C) Furnish shop drawings for use of other trades.

8.06 SETTING - Set sleeves, anchor bolts, and inserts required to accommodate equipmentbefore concrete is placed and masonry is set.

8.07 CUTTING AND PATCHING - Do not cut any work of other trades until approval has beenobtained from Designer. Employ service of trade whose work is cut or damaged to repair such cuts and damage.

8.08 COVERING - Do not cover any work until it has been tested, inspected and approved byDesigner and other authorities having jurisdiction.

8.09 PAINTING - Remove all rust from equipment and support framing. Finish painting as specified in DIVISION 9, but this Contractor will furnish all equipment with factory prime coator protection ready for finished painting.

8.10 SUPERVISION - Employ the services of a competent, qualified mechanic in each phase ofwork to continuously supervise the work. Insofar as possible, keep same supervisor and workmen on job for full duration of work.

8.11 GUARANTEES - Provide warranty cards, properly filled out with serial and model numbers, location, dates, etc., and turn over to Designer for deliver to Owner. Warranty cardsare required on all items with warranty over one year.

END OF SECTION 230000

SECTION 230001 - UTILITIES EXCAVATING AND BACKFILLING

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 PROTECTION: See Foundation Excavating and Backfilling Section.

1.04 SOIL CLASSIFICATION: See Items Affecting Site Work Section.

1.05 COORDINATION: Coordinate with other trades whose work will be affected by this work.

PART II - PRODUCTS

2.01 FILL STONE: Natural gravel or crushed stone not more than 3/4" in its largest dimension.

2.02 SAND: Equal to masonry mortar sand.

2.03 EARTH BACKFILL: See Foundation Excavating and Backfilling Section.

2.04 BURIED WARNING AND IDENTIFICATION TAPE:

A) Polyethylene plastic and metallic core and metallic-faced, acid and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, color coded as stated below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tapelength. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing is to be permanent, unaffected by moisture orsoil.

Warning Tape Color

CodesRed: Electric
Yellow: Gas, Oil, Dangerous Materials
Orange: Telephone and Other
CommunicationsBlue: Water Systems
Green: Sewer Systems
White: Steam Systems

B) Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape

conforming to the width, color, and printing requirements indicated

above.PART III - EXECUTION

3.01 GENERAL EXCAVATION:

A) Keep excavations free from water while construction is in progress. Notify the General Contractor immediately in writing if it becomes necessary to remove hard, unstable, or otherwiseunsatisfactory material to a dept greater than indicated. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. Excavate unyielding material to an overdepth at least 6 inches below the bottom of the pipe unless otherwise indicated or specified. Blasting will not be permitted. Use bedding material placed in 6-inch-maximum layers to refill overdepths to the proper grade. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil, or bedding material. Dig bell holes and depressions for joints after trench has been graded.

B) Shoring and Sheeting: Shore and sheet excavations with various member sizes arranged to prevent injury to persons and damage to structures. Also arranged shoring and sheeting to preclude injurious caving during removal. Obtain approval from the General Contractor prior toremoving any shoring, sheeting, or bracing in excavations adjacent to on-grade slabs, foundations, or other structural elements.

C) Stockpiling Topsoil: Strip suitable soil from the site where excavation or grading is indicatedand stock pile separately from other excavated material. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil.

D) Cutting Pavement: Make cuts with neat, parallel, straight lines one foot wider than trenchwidth on each side of trenches and one foot beyond each edge of pits.

E) Trenches may be excavated with trenching machines or backhoe.

F) Excavate to depth 6" greater than bottom side of copper piping and gas piping in finalposition, and backfill with sand.

G) Sanitary and storm sewer pipe and cast iron water lines shall be laid on 6" bed of crushedstone.

H) If it is necessary to lay pipe on rock or sandstone, excavate and backfill for sanitary sewerand water lines as specified above for copper piping.

I) Keep trenches dry and grade surface so that water will not drain into trenches. If water does

get into trenches, pump and bail as necessary to remove it. Do not allow any pipe to be laid inwet, muddy, or frosty trenches.

J) Water piping trenches may be cut as narrow as desired, provided piping can be properlybedded, connected and inspected.

K) Cut sewer line and water line trenches sufficiently wide to allow for jointing, bedding, and visual inspection of top and at least 1/2 of each side of pipe, measuring from top center line. Forsewer lines place batterboards at 25'-0" intervals for establishing uniform rates of fall. Mark thedistance from top of batterboard to invert of pipe on each batterboard. Inside building pitch trenches so that sewer pipe shall have a drop of at least 1/4" foot.

L) Provide separate trenches for sewers and water lines. Allow at least 3'-0" of undisturbedearth between water and sewer trenches.

M) Where sewer lines and water lines are within 3'-0" of each other, and wherever they cross,place sewer lines at least 12" below water lines.

N) Install geothermal lines 3'-0" minimum below the surface, with 6" of sand below pipe. If more than 1 set of supply/return lines are to be run in one trench, separate the supply lines fromthe return lines by 2'-0".

3.02 BACKFILLING

A) Do not backfill utility trenches until lines are installed, tested and approved.

B) Backfill sewer, steel and cast iron pipe trenches inside building with fillstone to level of earthfill. Tamp to insure full settlement.

C) Backfill copper water line trenches with 6" layers, minimum of 12" of sand and then finishbackfill as specified above for sewer of trenches. Inside building fill to grade with aggregate.

D) Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings.Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

E) Compaction of Pipe and Conduit Bedding: In rock, compact to 95 percent and in soil,compact to 90 percent of ASTM D1557 maximum ASTM D4254 relative density.

F) Compaction of Backfill: Compact initial backfill material surrounding pipes, cables, conduits, or ducts, to 95 percent of ASTM D4254 maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same

material, compact initial

backfill to the density of the bedding. Under areas to be seeded or sodded, compact succeedinglayers of final backfill to 85 percent of ASTM D698 maximum density.

3.03 SPECIAL EARTHWORK INSTALLATION REQUIREMENTS:

A) Road, Streets, Building Slabs, and Other Areas to be Paved. Place final backfill in 6-inch- maximum loose lifts. If a vibratory roller is used for compaction of final backfill, the lift thickness can be increased to 9 inches. Compact all backfill surrounding pipes, ducts, conduits, and other structures to 90 percent of ASTM D1557 maximum density except compact the top 12inches of subgrade to 95 percent of ASTM D1557 maximum density. Backfill to permit rolling and compacting of the completed excavation with the adjoining material, providing the specifieddensity necessary to enable paving of the area immediately after backfilling has been completed.

3.04 CLEAN-UP

A) Distribute excess earth, remaining after backfill is completed, on the site, in area designated.

B) Remove excavated rock from property.

END OF SECTION 230001

SECTION 230523 - PIPE, VALVES, FITTINGS, AND ACCESSORIES

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 PIPE

A) Materials for general service pipe systems, low-pressure, nominal corrosion, low-temperatureservice.

1. Steel pipe - black or galvanized - ASTM A-53 or A-120, Sch 40

2. Copper pipe (tube) - ASTM B-88, type M or L, soft or hard drawn

3. Plastic pipe - PVC Sch 40 ASTM D 1785 (cannot be used within fire rated partitionsand must be firestopped using approved, listed firestopping systems).

2.02 FITTINGS: ELLS, TEES, CROSSES, BUSHINGS

A) Materials for fittings shall match the pipe system category for pressure, temperature, andcorrosion.

B) Fittings for low pressure, and/or temperature shall be:

1. Steel - galvanized or black Size under 2 in. Screwed, malleable iron fittings, Class 1502 in. and l Screwed, malleable iron fittings, Class 150 Welded, steel butt-welding fittings, Sch 4 Grooved couplings, ductile iron clamps, Sch 40 fitting

2. Copper - wrought or cast copper, solder type

3. PVC - PVC Sch 40, solvent-welded type with primer

2.03 UNIONS

A) Materials for unions shall match the pipe system category for pressure, temperature, andcorrosion.
B) Unions for low pressure and/or low temperature shall be:

1. Steel - screwed, Class 150, malleable iron, O-ring or brass seat welded neck flangeswith gaskets

2. Copper - cast copper to copper, metal seat

3. PVC - solvent welded, flange to flange, with gasket

C) Dielectric unions shall separate all ferrous and nonferrous metals in every piping system.Unions shall match those above, except that metal-to-metal contact is to be avoided. Where flanges are used, the bolts shall be insulated from the body of the flange.

2.04 VALVES - GENERAL

A) Materials for small valves shall be all brass and for larger valves shall be cast iron, castductile iron, or cast steel, as required for the pressure and service of the valve and as listed below.

2.05 LOW-PRESSURE VALVES

A) Low-pressure valves for gravity and city water, low-pressure steam, and compressed air shallbe as follows:

VALVES 2 IN. AND SMALLER

1. Ball valves for throttling service shall be one-piece body, reduced port, Stockham S-127BR1, or equivalent.

2. Ball valves for shutoff service shall be two-piece body, full port, Hammond #8301threaded, Hammond #8311 sweat or equivalent.

2.06 CHECK VALVES

A) Materials for small valves shall be all brass and for larger valves shall be cast iron, castductile iron, or cast steel, as required for the pressure and service of the valve and as listed below.

B) Check valves for gravity systems, city water, low-pressure steam compressed air shall be asfollows:

VALVES 2 IN. AND SMALLER

1. For service less than 150 deg. F: Class 125, bronze body with Buna-N disk seat,Hammond IB904 or equivalent.

2. For service up to 450 deg. F: Class 125, bronze body with TFE disk, HammondIB940 or equivalent.

3. For pressures up to 200 psi: Class 150, bronze body with Teflon disk, HammondIB946 or equivalent.

2.07 PIPE JOINT MATERIALS

A) Screwed pipe joints shall be made up using Teflon tape, Rectorseal No. 5 pipe dope, or otherlubricants, as approved for the particular installation.

B) Soldered joints shall be made up with paste flux and 50/50 solder, 95/5 solder, or silversolder, as required under Part III, Execution.

2.08 PIPE SUPPORT SYSTEM

A) Provide an adequate pipe suspension system in accordance with recognized engineering practices, using, where possible, standard, commercially accepted pipe hangers and accessories.Coordinate locations and weight of pipe hangers with structural system.

B) All pipe hangers and supports shall conform to the latest requirements of the ASA Code for Pressure Piping, B 31.1, and Manufacturers' Standardization Society documents MSS SP-58 andMSS SP-69.

C) The pipe hanger assembly must be capable of supporting the line in all operating conditions.Accurate weight balance calculations shall be made to determine the supporting force at each hanger in order to prevent excessive stress in either pipe or connected equipment.

D) Where references below refer to "type," these references shall be to Federal Specification WW-171. Where reference is to "Figure," it shall be to Fee & Mason designations used in theircatalog. Equivalent products by Grinnell and others are acceptable.

1. Concrete Inserts
   Where piping is supported from a concrete structure, inserts shall be type 18, 19 shallbe used, or structural shapes where provided where a continuous insert is rod size exceeds 7/8 in. diameter or where the pipe load exceeds the recommended load for the insert, use two inserts with a trapeze-type connecting member below the concrete.

2. Beam Clamps
   Where piping is to be supported from structural steel, beam clamps, type 21, 28, 29, 30or 31, shall be used. Beam clamp selection shall be on the basis of

the required load to be supported. Where welded beam attachments are required, they shall be Figure 90,

131, 251, or 266. Holes drilled in structural steel for hanger support rods will not bepermitted.

3. Riser Clamps
   All vertical runs of piping shall be supported at each floor, and/or at specified intervals, by means of type 8 clamps for steel pipe, or Figure 368 clamp for coppertubing.

4. Hanger Rods
   Hanger rods shall be ASTM A-107 continuous-threaded rod. Eye rods shall be Figures228 and 228 WL. Where hanger Rod sizes are catalog-listed for a specified hanger, these sizes shall govern. Where hanger rod sizes are not listed, the load on the hanger shall be the determining factor, and the maximum recommended hanger rod load as shown shall govern.

5. Hanger Rod Loading
   Maximum hanger rod load shall not exceed:

Rod diameter Inches	3/8	1/2	5/8	3/4	7/8
Max load Pounds	610	1130	1810	2710	3770

6. Hanger Spacing
   The maximum allowable spacing for pipe hangers shall be in accordance with tabulation below. Where concentrated loads of valves, fittings, etc., occur, closer spacing will be necessary and shall be based on the weight to be support maximumrecommended loads for the hanger components.

STEEL PIPE

Nominal Pipe Size	Maximum Space Between Hangers
Up to 1 1/4 in.	7 feet
1 1/2 in.	9 feet
2 in. & 3 in.	10 feet
4 in. & 5 in.	14 feet

COPPER PIPE

Nominal Tube Size	Maximum Space Between Hangers
Up to 1 in.	5 feet
1 1/4 to 2 in.	7 feet
2 1/2 in.	9 feet
3 in.	10 feet
3 1/2 & 4 in.	12 feet

FRP and PVC pipe supports - Consult manufacturer's data for conditions andtemperatures involved.

7. Hangers
   a) All hangers for piping 2 in. or larger shall be provided with means of verticaladjustment.
   b) On uninsulated steel pipe, hangers shall be type 1, 4, 6, or 11. On piping 2 in. andsmaller, Figure 9, 10, or 25 will be permitted.
   c) On uninsulated copper tubing, hangers shall be Figure 307, 364, or 365, or type 10or 11.
   d) On hot insulated steel pipe, hangers shall be Figure 261 or welded attachmentsFigure 90, 92, 94, or 96. Where thermal movement causes the hanger rod to deviate more than 5 deg. from the vertical or where longitudinal expansion causes a movement of more than 1/2 in. in the piping supported from below,roller hangers, type 42, 44, 45, 47, or 48, shall be used in conjunction with a protection saddle, type 40, to suit the insulation thickness. On insulated steel pipefor chilled water or similar service, the hanger must be placed on the outside of the insulation with a type 41 shield.
   e) On insulated copper tubing, hangers shall be Figure 199, 201, 202, or 215 and shallbe placed on the outside of the insulation with a type 41 shield. The type 41 shield shall be applied to distribute the hanger load over the insulation to eliminate damage to the vapor barrier on the covering.
   f) Base supports shall be type 39.

8. Brackets and Racks
   Where piping is run adjacent to walls or steel columns, welded steel brackets, types32, 33, and 34, shall be used as base supports. Multiple pipe racks or trapeze hangers shall be fabricated from channel and accessories designed for this purpose.

9. Spring Hangers
   Spring Hangers shall be installed at hanger points where vertical thermal movement occurs. For light loads and non-critical movements in excess of 1/4 in., type 49, 50, or 51, variable spring supports shall be used.

10. Critical Systems
    On critical systems, where movement is in excess of 1/2 in constant supports, type 52, shall be used. For vibration and/or shock loadings, use Figure 470, 471, or 472, sway braces. Where it is necessary to reduce pipe vibration and sound transmission building steel, Figure 403 or 404 vibration control hangers shall be used.

11. Anchors, Guides, and Sliding Supports
    Anchors shall be installed as shown on the piping drawings. They may be Figure 140,141, or 159. Guides shall be Figure 120, 121, 122, or 165. Sliding supports shall be Figure 143 or 145.

12. Auxiliary Steel

All auxiliary steel necessary for this installation of the pipe hangers and supports shallbe designed in accordance with the AISC Steel Handbook, shall be furnished by the contractor, and shall receive one shop coat of primer paint.

13. Submittals
The contractor shall submit to the engineer, prior to installation, the following information and data for review and acceptance.
a) Manufacturer's data sheets on all cataloged items to be used.
b) Sketches covering all specially designed hanger assemblies and fabrications.
c) Sketches showing locations, loads, calculated travel, type, and sizes of all springhanger assemblies.

2.09 EXPANSION TANKS

A) Every closed system shall be provided with an expansion tank to prevent significant changesin system pressure caused by expansion and contraction of fluids due to temperature changes.

2.10 EXPANSION COMPENSATION

A) Pipe installation shall allow for expansion due to temperature differences. Provide expansionloops, or joints, as shown on the drawing, as follows.

B) Expansion joints shall be designed for the service, temperature, piping type, and pressure ofthe system and sized to accommodate the amount of movement required from maximum to minimum temperatures encountered by the system.

C) Joints for water systems shall be reinforced rubber corrugations secured by steel flanges.The number of corrugations shall be determined by the amount of movement required.

D) Joints for steam or higher-temperature fluids shall be composed of multiple layers of thin stainless steel, corrugated and mounted between flanges. The number of corrugations shall beselected for the movement involved.

E) Every expansion joint shall be provided with stay bolts to prevent expansion beyond thenormal design limits. Rubber joints shall have stay bolts isolated in rubber where used to eliminate vibration.

2.11 PIPE SLEEVES

A) Provide pipe sleeve of galvanized steel at each wall or floor penetration. Sleeve shall be nolighter than 18 gauge and shall be built into the wall or floor during construction of the wall. Where pipes are insulated, the sleeve shall allow for insulation thickness.

B) Wall sleeves shall be even with both sides of the finished wall.

C) Floor sleeves shall project approximately 1/2 in. above the finished floor and be even withthe underside of the floor. Floor sleeves shall be cast in place or permanently sealed into the floor structure to prevent any water on the floor from following the pipe system.

2.12 ESCUTCHEONS

A) Provide escutcheon on each side of wall or floor penetrations to provide a finished appearance. For insulated pipes, the escutcheon shall surround the outside of the insulation.

B) Escutcheons for small pipes may be spring clip type. Escutcheons for larger pipes shall beheld by setscrews.

PART III - EXECUTION

3.01 INSTALLATION OF PIPE SUPPORTS

A) Install concrete inserts, beam clamps, or other fixtures to support the pipe hangers acceptableto the engineer.

B) Provide hanger rods and loops, or clevises, to support the pipe at the height and graderequired for proper drainage and air elimination.

3.02 INSTALLATION OF PIPE

A) Cut pipe accurately to measurements, and ream free of burrs and cutting splatter. Carefullyalign and grade pipe, and work accurately into place. Fittings shall be used for any change in direction. Make adequate provisions for expansion and contraction. Install anchors to prevent pipe movement, as shown on the drawings. Provide expansion loops, or joints, as shown on thedrawings and where required to compensate for pipe expansion. Provide for expansion at everybuilding expansion joint.

B) Protect open pipe ends to prevent trash being placed in the lines during installation. Clean alldirt and cutting debris from pipes before making the next joint.

C) Small pipe shall be screwed or soldered as required to produce a tight system with full jointsand no leaks. Pipe joints showing seepage and drips shall be dismantled and remade in proper way, as required by proper installation.

D) Copper pipe shall be carefully reamed back to full inside diameter, and the mating surfaces shall be cleaned by brush or sandpaper. When clean, the paste flux shall be applied and the jointevenly heated and soldered. Any fittings discolored by heat shall be removed and replaced.

E) Solder joints in shall be soldered with a product having a melting point of 1100 deg.

F silversolder or above, applied with the proper torch and flux.

F) All valves to be soldered into lines shall be dismantled to prevent the heat form destroyingpacking and seats.

G) Valves installed in screwed lines shall be properly supported and pipes carefully installed toprevent damage or distortion of the valve.

H) Grooved pipe shall be carefully prepared and all burrs removed inside and outside of the pipe. The proper lubricant shall be applied and the gasket carefully placed prior to tightening theclamps to the correct torque.

I) Install drains at every low place and air vents at every high place. Pipe shall slope as shownon the drawings at 1 in. every 40 ft. required above.

J) Install pressure gauges and thermometers as shown in details and on drawings. Every pump and coil shall be provided with pressure gauge and thermometer. Every piece of equipment thatproduces chilled or hot water or steam or uses chilled or hot water or steam shall be provided with gauges and thermometers on entering and leaving sides.

K) Steel pipe fittings 2-1/2" and larger: Butt weld fittings, meeting requirements of ASA B 16.9Standard. Use fittings matching weight of pipe. Use long radius ells. Weldolets, meeting requirements of ASA B16.11 for butt welding fittings, may be used for branch connections.

L) Steel pipe fittings 2" and smaller: Black or galvanized malleable iron screwed fittings. Usegalvanized fittings with galvanized pipe. Make screwed joints with Teflon tape. Coat gas pipefittings with plastic wrapping tape, Polyken or equal.

M) Copper pipe fittings: Wrought copper, solder joint type, or mechanically formed teeconnections with brazed joints and notched connector pipe.

N) PVC pipe fittings: Polyvinylchloride type to match weight of PVC pipe specified.

O) Dielectric unions shall separate all ferrous and nonferrous metals in every piping system so that metal-to-metal contact is avoided. Where flanges are used, the bolts are to be insulated fromthe body of the flange.

3.03 ROUTING

A) Run piping true-to-grade and arrange it to make best appearance. Run piping parallel and perpendicular to lines of building. Provide offsets where required by construction and to avoidwaste of floor space.

B) Cut piping to measurements made on job. Carefully work piping into place without springing or forcing. Make provision for absorbing expansion and contraction without unduestress in any part of system.

C) EQUIPMENT CONNECTIONS: Connect piping to equipment with unions or flanges to allow for servicing and removal of equipment without dismantling piping. Copper connections1-1/2" and smaller may be made without unions or flanges.

D) EQUIPMENT ISOLATION: Provide shut-off valves for each supply pipe connecting toequipment.

E) VALVE CONNECTIONS: Locate shut-off and control valves for easy access and operation.Provide access doors where valves are located in enclosed spaces.

3.04 CLEANING AND TREATING OF PIPE SYSTEMS

A) Every pipe system shall be cleaned to remove trash, mill scale, cutting oil, and welding andburning splatter from the lines before any control devices are installed. If such debris has collected in valves, the valves shall be disassembled and cleaned prior to closing for the first time.

B) After several hours of operation, each strainer shall be blown down. This shall be repeated asoften as necessary to produce a clean discharge from the blowdown. Prior to turning system over to the owner, every strainer shall be removed and cleaned.

3.05 TESTING

A) Every pipe system shall be tested at 1.5 times its operating pressure, but no less than 125 psiunless the engineer agrees to a lesser pressure.

B) Pipe and fittings shall be tested before any insulation or other covering is applied.

C) Testing may be performed in sections before vital equipment is connected if the test pressureis above the equipment rating.

D) Steam piping shall be checked again when hot, at the operating pressure and temperature.

E) Test medium shall be water under hydrostatic pressure with all air removed from the system.With engineer's consent, the test may be performed with compressed air to prevent danger from freezing. Hydrostatic pressure shall be held for not less than 2 hr. with no drop in pressure. Airtest shall be held for no less than 4 hr. and the engineer may require longer test periods. Questionable joints shall be soaped to prove tightness.

F) The engineer, or representative, shall observe all tests. Notice to the engineer shall be giventwo full days before the testing is to be performed.

3.06 DESTRUCTIVE TESTING

A) The engineer reserves the right to select, at random, four fittings already completely installed

for destructive testing. These joints shall be removed, by the contractor, with the connecting pipe, and the contractor shall replace these fittings at the contractor's expense. The engineer maydestroy these joints by cutting them apart, separating soldered joints to check for full coverage, grinding the weld areas to observe voids, slag inclusions, or other defects. If major defects are noted in these joints, the contractor shall take corrective action to remedy the cause, and additional testing shall be performed to ensure that the system is adequate and complies with these Specifications and good workmanship.

END OF SECTION 230523

SECTION 230548.10 - VIBRATION ISOLATION and WIND RESTRAINT

PART I - GENERAL

1.01 THE GENERAL and SPECIAL CONDITIONS, Section 230000, are included as part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

I.03 DESCRIPTION

A) Intent

1) All mechanical equipment, piping and ductwork as noted on the equipment schedule or inthe specification shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolatorsshall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.

2) All isolators and isolation materials shall be of the same manufacturer and shall be certifiedby the manufacturer.

3) All such systems must be installed in strict accordance with wind codes, component manufacturer's and building construction standards. Whenever a conflict occurs betweenthe manufacturer's or construction standards, the most stringent shall apply.

4) This specification is considered to be minimum requirements of wind consideration and isnot intended as a substitute for legislated, more stringent, national, state or local construction requirements.

5) Any variance or non-compliance with these specification requirements shall be corrected bythe contractor in an approved manner.

B) The work in this section includes, but is not limited to the following:

1) Equipment isolation bases.

2) Seismic restraints for isolated equipment.

3) Certification of seismic restraint designs and installation supervision.

4) All mechanical and electrical systems. Equipment buried underground is excluded but entryof services through the foundation wall is included. Equipment referred to below is typical. (Equipment not listed is still included in this specification).

AC Units Chillers Fans (All types) Tanks (All types)Air Distrib. Boxes Compressors Generators Transformers
Air Handling Units Comp. Room Units Heat Exchangers Unit HeatersAir SeparatorsCondensers Light Fixtures Unit Substations Battery Racks Condensing Units Motor Control Ctrs. Var. Freq. Drives Boilers Conduit Piping Water Heaters Bus Ducts Cooling Towers Pumps (All types)Cabinet Heaters Ductwork Rooftop Units Cable Trays Electrical Panels Switching Gear

1.04 SUBMITTAL DATA REQUIREMENTS

A) The manufacturer of vibration isolation and wind restraints s hall provide submittals forproducts as follows:

1) Descriptive Data:

a) Catalog cuts or data sheets on vibration isolators and specific restraints detailingcompliance with the specification.

b) Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolatorsand wind restraints by referencing numbered descriptive drawings.

2) Shop Drawings:

a) Submit fabrication details for equipment bases including dimensions, structural membersizes and support point locations.

b) Where walls, floors, slabs or supplementary steelwork are used for wind restraint locations, details of acceptable attachment methods must be included and approved beforethe condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.

c) Provide specific details of seismic wind and anchors; include number, size and locationsfor each piece of equipment.

3) Wind Certification and Analysis:

a) Wind restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at

least five years of wind design experience, licensed in the state of the job location.

b) Analysis must indicate calculated dead loads, peak wind loads and capacity of materialsutilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. Overturning moments may exceed forces at ground level.

1.05 CODE AND STANDARDS REQUIREMENTS

A) Typical Applicable codes and Standards

1) International Building Code,

2) Florida Building Code,

3) BOCA National Building Code by Building Officials and Code AdministratorsInternational, Inc.,

4) Uniform Building Code by International conference of Building Officials,

5) NFPA - 13 and 14.

6) Applicable Florida Wind Restraint Guidelines.

1.06 MANUFACTURER'S RESPONSIBILITY

A) Manufacturer of vibration isolation and wind control equipment shall have the followingresponsibilities:

1) Determine vibration isolation and wind restraint sizes and locations.

2) Provide vibration isolation and wind restraints as scheduled or specified.

3) Provide calculations and materials if required for restraint of unisolated equipment.

4) Provide installation instructions, drawings and trained field supervision to insure properinstallation and performance.

1.07 RELATED WORK

A) Housekeeping Pads

1) Housekeeping pad reinforcement and monolithic pad attachment to the structure details anddesign shall be prepared by the restraint vendor if not already indicated on the drawings.

2) Housekeeping pads shall be coordinated with restraint vendor and sized to provide a

minimum edge distance of ten (10) bolt diameters all around the outermost anchor to allowdevelopment of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.

B) Supplementary Support Steel

1) Contractor shall supply supplementary support steel for all equipment, piping, ductwork,etc. including roof mounted equipment, as required or specified.

C) Attachments

1) Contractor shall supply restraint attachment plates cast into housekeeping pads, concreteinserts, double-sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

PART II - PRODUCTS

2.01 INTENT

A) All vibration isolators and wind restraints described in this section shall be the product of a single manufacturer. Mason Industry's products are the basis of these specifications; products ofother manufacturers are acceptable provided their systems strictly comply with the specification and have the approval of the specifying engineer. Submittals and certification sheets shall be in accordance with section 1.02.

B) For the purposes of this project, failure is defined as the discontinuance of any attachmentpoint between equipment or structure, vertical permanent deformation greater than 1/8 inch and/or horizontal permanent deformation greater that 1/4 inch.

2.02 PRODUCT DESCRIPTIONS

A) Vibration Isolators and Wind Restraints.

SPECIFICATION:

1. Two layers of 3/4" thick neoprene pad consisting of 2" square waffle modules separated horizontally by a 16 gauge galvanized shim. Load distribution plates shall be used as required.Pads shall be Type Super "W" as manufactured by Mason Industries, Inc.

2. A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround theanchor bolt and have a flat washer face to avoid metal to metal contact. Neoprene bushings shallbe type HG as manufactured by Mason Industries, Inc.

3. Spring isolators shall be free standing and laterally stable without any housing and complete

with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the baseplate andthe support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height andsolid spring height. Mountings shall be Type SLF as manufactured by Mason Industries, Inc.

4. Seismic Wind Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowedto bend across sharp edges. Cable assemblies shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified load ratings. Cable assemblies shall be Type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod nut and the clevis or SCBV if clamped to a beam all as manufactured by Mason Industries, Inc.

5. Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wirethat is "rolled up" to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads. Drill-in stud wedge anchors shall be type SAS as manufactured by Mason Industries, Inc.

6. Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedgeanchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying to its allowable loads. Drill-in female wedge anchors shall be type SAB as manufactured by Mason Industries, Inc.

7. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces.All directional neoprene snubber bushings shall be a minimum of 1/4" thick. Steel springs shall be laterally stable and rest on 1/4" thick neoprene acoustical pads. Hardware must be plated andthe springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2" of insulation. The roof curbs shall be built to seismically contain the rooftop unit. The unit must be solidly fastened to the top floating rail, and the lower Z section anchored to the roof structure. Curb shall

have anchorage preapproval "R" from OSHPD in the state of California attesting to the maximum certified horizontal and vertical load ratings. Curb shall be type RSC as manufactured by MasonIndustries, Inc.

8. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be astabulated:

Flanged	Male Nipples
3 x 14 10 x 26	1/2 x 9 1 x 13
4 x 15 12 x 28	3/4 x 10 2 x 14
5 x 19 14 x 30	1 x 11 2 x 18
6 x 20 16 x 32	1 x 12
8 x 22	

Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel tothe equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

PART III - EXECUTION

3.01 - GENERAL

A) All vibration isolators and wind restraint systems must be installed in strict accordance withthe manufacturers written instructions and all certified submittal data.

B) Installation of vibration isolators and wind restraints must not cause any change of positionof equipment, piping or duct work resulting in stresses or misalignment.

C) No rigid connections between equipment and the building structure shall be made thatdegrades the noise and vibration control system herein specified.

D) The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is notlimited to, slabs, beams, columns, studs and walls.

E) Coordinate work with other trades to avoid rigid contact with the building.

F) Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts afterinstallation shall be at the responsible contractor’s expense.

G) Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation.Corrective work necessitated by discrepancies after installation shall be at the responsible contractor’s expense.

H) Correct, at no additional cost, all installations which are deemed defective in workmanshipand materials at the contractors expense.

I) Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval.Generally bracing may occur from:

1) Flanges of structural beams.

2) Upper truss cords in bar joist construction.

3) Cast in place inserts or wedge type drill-in concrete anchors.

J) Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting theisolated suspended equipment, piping or conduit.

K) Specification 12 cable assemblies are installed taut on non-isolated systems.

L) Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontalthrust restraint shall be specification type 28 (see selection guide).

END OF SECTION 230548.10

SECTION 230593.20 - AIR DISTRIBUTION SYSTEM TEST AND BALANCE

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 Air balance shall be performed by qualified personnel experienced in this field. The airbalance procedure followed and forms used shall agree with NEBB TAB Standards.

1.04 Mechanical Contractor shall make changes to pulleys, belts, dampers, impellers, andsimilar equipment to obtain design conditions at no additional cost to the owner.

1.05 The test and balance activities are to be done by an independent Test and Balance Contractor who is in no way associated with the Mechanical Contractor. The cost for the Testand Balance Contractor services is to be paid by the General Contractor.

PART II - PRODUCTS

2.01 EVALUATION OF SYSTEM

A) The Mechanical Contractor shall furnish all materials and equipment necessary to properlymeasure the air capacity of the system, the electrical voltage and current, fan speeds, static pressure, air velocity, refrigeration pressures, and all other readings normally necessary to evaluate the performance of a system, adjust the quantities to those called for, and test the system.

2.02 SYSTEM PERFORMANCE

A) The Mechanical Contractor is responsible for the performance of the equipment and the system installed. Contractor cannot assume that supplier will ship equipment adjusted to meetthe job requirements.

2.03 EQUIPMENT OPERATION

A) All equipment shall be checked for proper operation as soon as electrical power is availableto do so. Any malfunction shall be reported to the manufacturer, and corrective action taken assoon as possible to prevent delay of the acceptance of the work.

2.04 EQUIPMENT PROBLEMS AND ADJUSTMENTS

A) Required adjustments and minor problems with mechanical equipment are to be expectedto

B) some extent, and it is the mechanical contractor's responsibility to determine if there are

any in the work and to correct them without causing any undue alarm on the part of theowner and without delay of the job.

PART III - EXECUTION

3.01 INITIAL BALANCING - AIR SYSTEMS

A) As soon as electrical power is available, the contractor shall check all equipment for electrical problems, check rotation of motors, read voltage and current in each leg of each motor,heater, etc., and check the readings against the nameplate.

3.02 RESPONSIBILITY FOR PROPER BALANCING AND TESTING

A) The GENERAL CONTRACTOR is responsible for the performance of the entire building,including the work in this Section. After the Mechanical Contractor has completed the mechanical system installation, the superintendent for the General Contractor shall monitor theBalancing and Testing of the system and shall certify that the readings required under this Section have actually been made and that all systems are in actual operation. The Test and Balance data shall be signed by the general superintendent. At time of final review, if it is apparent that these readings have not been made, or that equipment is not in operation, the expense for the return of the engineer and/or the architect shall be billed to the General Contractor.

3.03 On completion of work, submit three copies of the complete report to the Owner to includethe following:.

A) Dates, times, personnel, status of operating of cooling or heating.

B) A description of the procedure used for air balance.

3.04 The following are the requirements for air system.

A) The Test and Balance Contractor shall balance supply, return, and exhaust air outlets within10% of design while still maintaining required pressure relationships.

B) Design and actual fan RPM, fan suction and discharge static pressure, fan total static

pressure, and pressure drop across components. Design and actual supply, return, and outsideair.

C) Actual and motor nameplate voltage and amperage on fans.

D) Design and actual CFM and FPM at each supply, return, and exhaust outlet.

E) Design and actual entering and leaving air temperatures, heating and cooling at airconditioning units.

3.05 REVIEW BY DESIGNER

A) After the above information is received by the Designer, it will be reviewed and compared against the design. The Designer will review the job for the owner and recommend final acceptance or the holding of funds pending additional work. Such review will not be scheduled until the above information can be reviewed and accepted. The work required under this contractis not complete until this information is accepted as accurate and complete.

END OF SECTION 230593.20

SECTION 230713 - INSULATION

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnished and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 SUBMITTALS

A) Submittals are required for each insulation type and each finish type, with a brief writtenexplanation of installation method.

B) Submit a Material Safety Data Sheet (MSDS) for each material utilized on this project whichis listed with permissible exposure levels (PEL) by OSHA or threshold limiting values (TLV) byACGIH.

PART II - PRODUCTS

2.01 INSULATION, GENERAL

A) Test all insulating systems on a composite basis in accordance with ASTM E-84, NFPA 225,90A & 90B and UL 723. Rating not to exceed FHC25/50.

B) All material to be finished with surfaces having a maximum flame spread rating of 25 and amaximum smoke developed rating of 50 under ASTM E-84, NFPA 225, and UL 723.

C) All insulation R-values must be, as a minimum, equal to ASHRAE 90.1-2010 requirements.

2.02 INSULATION TYPES

A) Type FB: Fiberglass Blanket (flexible): K factor of 0.24, density of 1.5 lbs./cu. ft., FSKjacket.

B) Type FIB: Fiberglass Insulation Board: K-Factor of 0.23, density of 3.0 lbs./cu. ft., FSKjacket.

C) Type FIR: Fiberglass (Rigid): K-Factor of 0.23, density of 3.0 lbs.cu. ft. ASJ-SSL jacket.

D) Type PF: Foamed Plastic (flexible): K-Factor of 0.25, density of 5.4 lbs./cu. ft.

E) Type PFW: Foamed Plastic (flexible): K-Factor of 0.27, density of 5.4 lbs./cu. ft., whitecolor, self-sealing lap, designed for domestic water piping applications.

F) Type CG: Cellular Glass: Equal to Pittsburg-Corning "Foamglass"; K-Factor or 0.35; 8.5 lb density per cubic foot; 100 psi compressive strength, noncombustible; 0.2% moisture absorption.

G) Where more than one insulation type is indicated the Contractor may use any one, but onlyone type shall be permitted per service.

2.03 JACKETS

A) ASJ: factory applied vapor retarder composed of white paper and aluminum foil laminate,with white kraft facing out.

B) ASJ-SSL: same as ASJ, except with self sealing lap for longitudinal and butt joints.

C) FSK: Glass scrim reinforced laminate of aluminum foil and draft paper, with foil facing out.

2.04 MISCELLANEOUS MATERIAL

A) Adhesives:

1. Fasting setting, rubber based, UL classified, vapor barrier lap and attachment adhesive,Foster 85-lb, Chillers CP-85.

2. Rubber based, UL classified, fast setting contact adhesive for adhering flexible cellularinsulation Foster, 82-40, Armstrong 520.

B) Paint: White vinyl lacquer coating for flexible plastic insulation.

C) PVC Jacketing Systems: Ceel-Co "Ceel-Tite 550" PVC-UVR, 20 mils thick, white color, orequal by Certain-Teed, Speedline fittings, Zeston, P.I.C. Plastic, Proto.

2.05 AIR HANDLING SYSTEM INSULATION

A) Low pressure supply ductwork:

1. Concealed: type FB insulation, 2" thick, foil jacket (vapor barrier), Type D1 application.

2. Exposed (and within 10' of blower): 1" thick liner. CertainTeed toughgard “R” liner.

3. Exposed (interior locations, where specified). 1” internal insulation in spiral duct. (FactoryApplied).

B) Low pressure return ductwork:

1. Concealed: Type FB insulation, 2" thick, foil jacket (vapor barrier), Type D1 application.

2. Exposed (interior locations): Type FIB insulation, 1.5” thick, Type D2 application.

C) All supply, return, and outside air ductwork located in unconditioned area to be insulatedwith 2" duct wrap, including lined ducts. All duct joints to be sealed with vapor retarding materials, covered in page 5 of this specification.

D) Exhaust air ductwork: Type FIB insulation, 1.5” thick, Type D2 application.

2.06 PIPING SYSTEM INSULATION

A) Domestic water (above slab):

1. Type FIR insulation: 1/2" thick on CW piping (all sizes); type P1 application.

2. Type PFW insulation, 1/2" thick on CW, for pipe sizes 1-1/4" and smaller. Install according to manufacturer's recommendations, with 3M #471 tape wrap at 24" o.c. and atterminations.

3. Type FIR. 1” thick on HW (piping) (all sizes). Type P1 application.

B) Storm drains (interior horizontal lines):

1. All locations - Type FIR insulation: 1/2" thick (1" thick at piping handling A/C unitcondensate), Type P1 application.

2. Concealed locations only - Type FB insulation: 1-1/2" thick, Type P1 application.

3. Insulate vertical lines run occupied in areas for sound attenuation.

C) Sanitary sewer lines handling A/C condensate:

1. Concealed locations only - Type PF insulation: ½” thick, Type P2 application.

D) Condensate drains (interior):

1. Type PF insulation: 1/2" thick, Type P2 application.

E) Geothermal lines inside building:

1. Type PF insulation: 1/2" thick, Type P2 application.

PART III - EXECUTION

3.01 WORKMANSHIP

A) All materials to be applied by Workman skilled in this trade. Unsightly work to be cause forrejection.

B) Mechanical fasteners to be used whenever possible to assure permanent construction.

C) Materials to be applied only after systems have been tested and all surfaces are clean and dry.

D) Cellular glass (type CG) block supports or other suitable noncompressible insulation materialequal in thickness to the insulation and three times the pipe diameter in length to be installed at hangers of cold piping to eliminate through-metal conductance.

E) Provide 18 GA galvanized 180 deg. sheet metal saddles of same length as block supports.

F) All insulation of cold surfaces shall be vapor sealed.

3.02 APPLICATION

A) General: Insulation shall be clean and dry when installed and during installation of anyfinish.

1. Install insulation materials with smooth and even surfaces, jackets drawn tight andcemented down smoothly at longitudinal and end laps. Do not use scrap pieces of insulation where a full-length section will fit.

2. Install insulation, jackets and coating continuous through openings and sleeves, except onductwork with fire/smoke dampers.

3. Banding wires to have twisted terminate turned down into the insulation, except wherevapor barrier would be punctured.

4. Finish open ends of pipe insulation with 45 deg. taper, all insulation sealed with vaporbarrier mastic or insulating cement.

5. Insulate fittings and valves with miter cut pieces of insulation same thickness as piping.

6. Insulate lines and equipment items not listed, on all surfaces subject to sweating, with 1"thick foamed plastic (Type RF) secured with a full coverage of adhesive.

B) Ductwork:

1. General: Prior to installation of insulation, all joints (traverse and longitudinal) shall bemade air tight with duct sealant.

2. Type D1: Wrap flexible fiberglass insulation around duct/pipe and secure with outward clinching staples. Ducts 24" wide and larger to have the insulation additionally secured with stick cups on 18" centers or with 4" wide bands of adhesive applied on 18" centers. Insulation to be lapped a minimum of 4" and all seams and penetrations to be sealed withduct tape.

3. Type D2: Secure rigid insulation board with welding pins and speed clips. Cover pins andclips with matching (foil faced) vapor retarder patches. Seal all joints and seams with ducttape.

4. Type D3: Secure rigid insulation board with welding pins and speed clips. Cover all pins and clips with matching (foil faced) vapor retarder patches. Seal all joints and seams with duct-tape. Cover expanded metal or wire mesh, insulating cement, and 8 oz. canvas. Paintwith two (2) coats of exterior grade epoxy paint.

C) Piping:

1. Type P1: Insulation to be butted together and securely stapled in place with outward clinching staples on 3" centers. Factory furnished laps to be installed at the butt joints.Where insulation terminates, bevel and finish neatly. Seal all laps and penetrations in vapor barrier jacket with approved vapor barrier mastic.

2. Type P2: Insulation shall be butted together and adhered in place with contact cement. Where possible tubing shall be slipped on without slitting. Neatly bevel and finish whereinsulation terminates, it with tape band. Insulation exposed on exterior shall be protectedwith 2 coats of white finish material.

3. Type P3: Insulation to be applied with all joints butted and buttered full depth with masticor joint sealant. Coat the entire surface in contact with the pipe with a thick coat of masticor joint sealant to fill all voids between the pipe and insulation. The insulation shall be applied before the mastic sets. All joints shall be staggered and tightly butted together. Use 16 gauge copper-weld banding wired 12" on center. Use white mastic or joint sealant.

4. Cover flexible connections, vibration isolators, etc. with foamed plastic insulation to achieve the following: Cover fitting with layers of foamed plastic insulation to same thickness of surrounding foamglass, then apply a 3/4" thick final cover of foamed plastic overlapping the adjacent jacket 3", tightly glued and sealed to the jacket. Paint the foamedplastic insulation with at least two (2) coats of white vinyl lacquer coating.

D) Piping, general:

1. Size insulation for fittings, valves and flanges to match adjacent straight run pipe insulationand fabricate from cellular glass. Seal all joints as above. Fill large voids between the insulation and fitting with light density fiberglass. Strainers and control valves to have removable covers for easy maintenance. Insulation and finish shall

not interfere with valve

operators.

2. Provide 3/4" thick foamed plastic insulation covers and caps for all valve stems and operators, gauge cocks, thermometer wells and other appurtenances subject to sweating.Caps and insulation fittings shall be formfitting with joints cemented.

E) PVC jacketing system:

1. Exposed areas in Mechanical Rooms and exterior locations: Cover insulation with PVC jacketing system, installed per the manufacturer's requirements. Use Ceal-Co #300 whitewelding adhesive for all joints except slip joints. Apply welding adhesive to joints full depth. Do not use tacks, bands, wire or tape to secure jacketing.

2. Caulk voids and openings with white silicon sealant. Provide slip joints every 25' on straight runs exceeding 25' in length. Overlap slip joints (four) 4" and be seal with silicon sealant. No excess adhesive or sealant to show in the finished jacket. At exterior locations,the joints to be oriented to shed water, and be positioned in the bottom quadrant on horizontal pipe.

END OF SECTION 230713

SECTION 230900 - AUTOMATIC TEMPERATURE CONTROLS - STANDARD THERMOSTATS

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part of thisSection as though written in full in this document.

1.02 HVAC controls shall basically be an electric/electronic system.

PART II - PRODUCTS

2.01 Thermostats shall be relay type with scale range suitable for the design control range and withfield adjustable scale. Thermostats shall be 7 day programmable.

2.02 SMOKE DETECTORS - Detectors shown shall be furnished by mechanical contractor andinstalled by electrical contractor; detectors shall be equal (as a minimum) to BRK Model 2650 orAir Products & Controls MS Series.

2.03 Freezestats shall be electric, manual reset type, with 20 foot remote lowest temperaturesensing bulbs and shall be U.L. approved.

2.04 Firestats shall be provided as shown on drawings and for each fan sized for 2000 CFM or more. An exception to the above is that firestats are not required on air handling units specified tohave duct mounted smoke detectors. Firestats shall be set at 50 degrees above the maximum operating temperature, (unit heating section discharge temperature). All firestats shall be of the
U.L. approved manual reset type.

PART III - EXECUTION

3.01 Thermostats shall be provided with adjustable setting and covers in all non-public spaces. Thermostats in public areas shall be blank front, key operated. Thermostats shall be mounted a maximum of sixty inches above the floor and eight inches horizontally from any light switch ifshown on the drawings adjacent to the light switch.

3.02 Room thermostat (where shown) locations shall be coordinated with door swings, lightswitches, and other wall mounted items and shall be approved by the Architect.

3.03 START-UP, CHECK OUT AND CALIBRATION - Certify that all controls have been testedand are operating properly within control and calibration ranges for operation of the system.

END OF SECTION 230900

SECTION 232300 – RERIGERANT PIPING

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as apart of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. Thepublications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 710 I-P	(2009) Performance Rating of Liquid-Line Driers
AHRI 720	(2002) Refrigerant Access Valves and Hose Connectors
ANSI/AHRI 750	(2007) Thermostatic Refrigerant Expansion Valves
ANSI/AHRI 760	(2007) Performance Rating of Solenoid Valves for UseWith Volatile Refrigerants

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2010; Addenda A, B, C, D, E, F, G, H, I, J, K, L, N and O; Errata 2011; INT 1 2012; Errata 2012; Addenda AD,SD, AE and AF 2013) ANSI/ASHRAE Standard 15- Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and SafetyClassification of Refrigerants
ASHRAE 17	(2008) Method of Testing Capacity of ThermostaticRefrigerant Expansion Valves

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metalsfor Brazing and Braze Welding
AWS BRH	(2007; 5th Ed) Brazing Handbook

AWS D1.1/D1.1M (2012; Errata 2011) Structural Welding Code - Steel

AWS Z49.1 (2012) Safety in Welding and Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.11 (2011) Forged Fittings, Socket-Welding and Threaded

ASME B16.21 (2011) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.22 (2012) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.26 (2011) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.5 (2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B16.9 (2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASME B31.1 (2012; INT 2-6, 8-10, 13, 15, 17-25, 27-31 and 42-46) Power Piping

ASME B31.5 (2010) Refrigeration Piping and Heat Transfer Components

ASME B31.9 (2011) Building Services Piping

ASME B40.100 (2005; R 2010) Pressure Gauges and Gauge Attachments

ASTM INTERNATIONAL (ASTM)

ASTM A193/A193M (2012a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications

ASTM A334/A334M	(2004a; R 2010) Standard Specification for Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog)Apparatus
ASTM B280	(2008) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B62	(2009) Standard Specification for Composition Bronzeor Ounce Metal Castings
ASTM B75/B75M	(2011) Standard Specification for Seamless CopperTube
ASTM B813	(2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM D3308	(2012) PTFE Resin Skived Tape
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM E84	(2012c) Standard Test Method for Surface BurningCharacteristics of Building Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MSS SP-69	(2003; Notice 2012) Pipe Hangers and Supports - Selection and Application (ANSI Approved AmericanNational Standard)

1.04 QUALITY ASSURANCE

1.05 DELIVERY, STORAGE, AND HANDLING

Protect stored items from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation is the Contractor's responsibility. Replace any materials found to be damaged at the Contractor's expense. During installation, cap piping and similar openings to keep out dirtand other foreign matter.

1.06 MAINTENANCE

PART II - PRODUCTS

2.01 STANDARD COMMERCIAL PRODUCTS

a. Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship and that have been in satisfactory commercial or industrial usefor 2 years prior to bid opening.

b. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer'sfactory tests, can be shown.

c. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on aregular and emergency basis during the warranty period of the contract.

d. Exposed equipment moving parts, parts that produce high operating temperature, partswhich may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Install safety devices so that proper operation of equipment is not impaired. Welding and cutting safety requirements shall be in accordance with AWS Z49.1.

e. Manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Include in the data manufacturer's recommended installation instructions and procedures. Provide data for the following components as a minimum:

a. Piping and Fittings
b. Valves
c. Piping Accessories
d. Pipe Hangers, Inserts, and Supports

2.02 ELECTRICAL WORK

Field wiring shall be in accordance with manufacturer's instructions.

2.03 REFRIGERANT PIPING SYSTEM

Refrigerant piping, valves, fittings, and accessories shall be in accordance with ANSI/ASHRAE 15 & 34 and ASME B31.5, except as specified herein. Refrigerant piping,valves, fittings, and accessories shall be compatible with the fluids used and capable of withstanding the pressures and temperatures of the service. Refrigerant piping, valves, and accessories used for refrigerant service shall be cleaned, dehydrated, and sealed (capped or plugged) prior to shipment from the manufacturer's plant.

2.04 PIPE, FITTINGS AND END CONNECTIONS (JOINTS)

2.04.1 Copper Tubing

Copper tubing shall conform to ASTM B280 annealed or hard drawn as required. Copper tubing shall be soft annealed where bending is required and hard drawn where no bending isrequired. Soft annealed copper tubing shall not be used in sizes larger than 1-3/8 inches.
Joints shall be brazed except that joints on lines 7/8 inch and smaller may be flared. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B62. Wrought copper and bronze solder-joint pressure fittings shall conform to ASME B16.22 and ASTM B75/B75M. Joints and fittings for brazed joint shall be wrought-copper or forged- brass sweat fittings. Cast sweat-type joints and fittings shall not be allowed for brazed joints. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and tothreaded ends of valves and equipment.

2.04.2 Solder

Solder shall conform to ASTM B32, grade Sb5, tin-antimony alloy for service pressures up to150 psig. Solder flux shall be liquid or paste form, non-corrosive and conform to

ASTM B813.

2.04.3 Brazing Filler Metal

Filler metal shall conform to AWS A5.8/A5.8M, Type BAg-5 with AWS Type 3 flux, exceptType BCuP-5 or BCuP-6 may be used for brazing copper-to-copper joints.

2.05 VALVES

Valves shall be designed, manufactured, and tested specifically for refrigerant service. Valve bodies shall be of brass, bronze, steel, or ductile iron construction. Valves 1 inch and smaller shall have brazed or socket welded connections. Valves larger than 1 inch shall have butt welded end connections. Threaded end connections shall not be used, except in pilot pressureor gauge lines where maintenance disassembly is required and welded flanges cannot be used. Internal parts shall be removable for inspection or replacement without applying heat or breaking pipe connections. Valve stems exposed to the atmosphere shall be stainless steel or corrosion resistant metal plated carbon steel. Direction of flow shall be legibly and permanently indicated on the valve body. Control valve inlets shall be fitted with integral or adapted strainer or filter where recommended or required by the manufacturer. Purge, charge and receiver valves shall be of manufacturer's standard configuration.

2.05.1 Refrigerant Stop Valves

Valve shall be the globe or full-port ball type with a back-seating stem especially packed for refrigerant service. Valve packing shall be replaceable under line pressure. Valve shall be provided with a handwheel operator and a seal cap. Valve shall be the straight or angle patterndesign as indicated.

2.05.2 Check Valves

Valve shall be the swing or lift type as required to provide positive shutoff at the differentialpressure indicated. Valve shall be provided with resilient seat.

2.05.3 Liquid Solenoid Valves

Valves shall comply with ANSI/AHRI 760 and be suitable for continuous duty with applied voltages 15 percent under and 5 percent over nominal rated voltage at maximum and minimum encountered pressure and temperature service conditions. Valves shall be direct- acting or pilot-operating type, packless, except that packed stem, seal capped, manual lifting provisions shall be furnished. Solenoid coils shall be moisture-proof, UL approved, totally encapsulated or encapsulated and metal jacketed as required. Valves shall have safe working pressure of 400 psi and a maximum operating pressure differential of at least 200 psi at 85 percent rated voltage. Valves shall have an operating pressure differential suitable for the refrigerant used.

2.05.4 Expansion Valves

Valve shall conform to ANSI/AHRI 750 and ASHRAE 17. Valve shall be the diaphragm and spring-loaded type with internal or external equalizers, and bulb and capillary tubing. Valve shall be provided with an external superheat adjustment along with a seal cap. Internal equalizers may be utilized where flowing refrigerant pressure drop between outlet of the valve and inlet to the evaporator coil is negligible and pressure drop across the evaporator is less than the pressure difference corresponding to 2 degrees F of saturated suction temperature at evaporator conditions. Bulb charge shall be determined by the manufacturer for the application and such that liquid will remain in the bulb at all operating conditions. Gas limitedliquid charged valves and other valve devices for limiting evaporator pressure shall not be used without a distributor or discharge tube or effective means to prevent loss of control when bulb becomes warmer than valve body. Pilot-operated valves shall have a characterized plug to provide required modulating control. A de-energized solenoid valve may be used in the pilot line to close the main valve in lieu of a solenoid valve in the main liquid line. An isolatable pressure gauge shall be provided in the pilot line, at the main valve. Automatic pressure reducing or constant pressure regulating expansion valves may be used only where indicted or for constant evaporator loads.

2.05.5 Safety Relief Valves

Valve shall be the two-way type, unless indicated otherwise. Valve shall bear the ASME codesymbol. Valve capacity shall be certified by the National Board of Boiler and Pressure VesselInspectors. Valve shall be of an automatically reseating design after activation.

2.05.6 Evaporator Pressure Regulators, Direct-Acting

Valve shall include a diaphragm/spring assembly, external pressure adjustment with seal cap,and pressure gauge port. Valve shall maintain a constant inlet pressure by balancing inlet pressure on diaphragm against an adjustable spring load. Pressure drop at system design loadshall not exceed the pressure difference corresponding to a 2 degrees F change in saturated refrigerant temperature at evaporator operating suction temperature. Spring shall be selected for indicated maximum allowable suction pressure range.

2.05.7 Refrigerant Access Valves

Refrigerant access valves and hose connections shall be in accordance with AHRI 720.

2.06 PIPING ACCESSORIES

2.06.1 Filter Driers

Driers shall conform to AHRI 710 I-P. Sizes 5/8 inch and larger shall be the full flow, replaceable core type. Sizes 1/2 inch and smaller shall be the sealed type. Cores

shall be ofsuitable desiccant that will not plug, cake, dust, channel, or break down, and shall remove

water, acid, and foreign material from the refrigerant. Filter driers shall be constructed so thatnone of the desiccant will pass into the refrigerant lines. Minimum bursting pressure shall be 1,500 psi.

2.06.2 Sight Glass and Liquid Level Indicator

2.06.2.1 Assembly and Components

Assembly shall be pressure- and temperature-rated and constructed of materials suitable forthe service. Glass shall be borosilicate type. Ferrous components subject to condensation shall be electro-galvanized.

2.06.2.2 Gauge Glass

Gauge glass shall include top and bottom isolation valves fitted with automatic checks, and packing followers; red-line or green-line gauge glass; elastomer or polymer packing to suit theservice; and gauge glass guard.

2.06.2.3 Bull's-Eye and Inline Sight Glass Reflex Lens

Bull's-eye and inline sight glass reflex lens shall be provided for dead-end liquid service. Forpipe line mounting, two plain lenses in one body suitable for backlighted viewing shall be provided.

2.06.2.4 Moisture Indicator

Indicator shall be a self-reversible action, moisture reactive, color changing media. Indicatorshall be furnished with full-color-printing tag containing color, moisture and temperature criteria. Unless otherwise indicated, the moisture indicator shall be an integral part of each corresponding sight glass.

2.06.3 Vibration Dampeners

Dampeners shall be of the all-metallic bellows and woven-wire type.

2.06.4 Flexible Pipe Connectors

Connector shall be a composite of interior corrugated phosphor bronze or Type 300 Series stainless steel, as required for fluid service, with exterior reinforcement of bronze, stainless steel or monel wire braid. Assembly shall be constructed with a safety factor of not less than 4at300 degrees F. Unless otherwise indicated, the length of a flexible connector shall be as recommended by the manufacturer for the service intended.

2.07 FABRICATION

2.07.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish, except that items located outside of buildings shall have weather resistant finishes that will withstand 125 hoursexposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen shall show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used shall be coated with a zinc-rich coating conforming to ASTM D520, Type I.

2.07.2 Factory Applied Insulation

Refrigerant suction lines between the cooler and each compressor shall be insulated with not less than 3/4 inch thick unicellular plastic foam. Factory insulated items installed outdoors arenot required to be fire-rated. As a minimum, factory insulated items installed indoors shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes shall be determined by ASTM E84. Insulation shall be tested in the same densty and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E84.

PART III - EXECUTION

3.01 INSTALLATION

Pipe and fitting installation shall conform to the requirements of ASME B31.1. Pipe shall becut accurately to measurements established at the jobsite, and worked into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation will not be permittedwithout written approval. Pipe or tubing shall be cut square, shall have burrs removed by reaming, and shall permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

3.01.1 Directional Changes

Changes in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide weep bends are formed. Mitering or notching pipe or other similar construction to form elbows or tees will not be

permitted. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bentpipe showing kinks, wrinkles, flattening, or other malformations will not be accepted.

3.01.2 Functional Requirements

Piping shall be installed 1/2 inch/10 feet of pipe in the direction of flow to ensure adequate oil drainage. Open ends of refrigerant lines or equipment shall be properly capped or plugged during installation to keep moisture, dirt, or other foreign material out of the system. Piping shall remain capped until installation. Equipment piping shall be in accordance with the equipment manufacturer's recommendations and the contract drawings. Equipment and pipingarrangements shall fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance.

3.01.3 Fittings and End Connections

3.01.3.1 Threaded Connections

Threaded connections shall be made with tapered threads and made tight with PTFE tape complying with ASTM D3308 or equivalent thread-joint compound applied to the male threads only. Not more than three threads shall show after the joint is made.

3.01.3.2 Brazed Connections

Brazing shall be performed in accordance with AWS BRH, except as modified herein. Duringbrazing, the pipe and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Brazing flux shall not be used. Surplus brazing material shallbe removed at all joints. Steel tubing joints shall be made in accordance with the manufacturer's recommendations. Joints in steel tubing shall be painted with the same material as the baked-on coating within 8 hours after joints are made. Tubing shall be protected against oxidation during brazing by continuous purging of the inside of the piping using nitrogen. Piping shall be supported prior to brazing and not be sprung or forced.

3.01.3.3 Welded Connections

Welded joints in steel refrigerant piping shall be fusion-welded. Branch connections shall be made with welding tees or forged welding branch outlets. Pipe shall be thoroughly cleaned ofall scale and foreign matter before the piping is assembled. During welding the pipe and fittings shall be filled with an inert gas, such as nitrogen, to prevent the formation of scale.
Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1.Weld defects shall be removed and rewelded at no additional cost to the

Government.
Electrodes shall be stored and dried in accordance with AWS D1.1/D1.1M or as recommendedby the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.01.3.4 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of theflare and the nut in order to avoid tearing the flare while tightening the nut.

3.01.3.5 Flanged Connections

When steel refrigerant piping is used, union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment requiring maintenance, suchas compressors, coils, chillers, control valves, and other similar items. Flanged joints shall be assembled square end tight with matched flanges, gaskets, and bolts. Gaskets shall be suitablefor use with the refrigerants to be handled.

3.01.4 Valves

3.01.4.1 General

Refrigerant stop valves shall be installed on each side of each piece of equipment such as compressors condensers, evaporators, receivers, and other similar items in multiple-unit installation, to provide partial system isolation as required for maintenance or repair. Stop valves shall be installed with stems horizontal unless otherwise indicated. Ball valves shall be installed with stems positioned to facilitate operation and maintenance. Isolating valves for pressure gauges and switches shall be external to thermal insulation. Safety switches shall notbe fitted with isolation valves. Filter dryers having access ports may be considered a point of isolation. Purge valves shall be provided at all points of systems where accumulated noncondensable gases would prevent proper system operation. Valves shall be furnished to match line size, unless otherwise indicated or approved.

3.01.4.2 Expansion Valves

Expansion valves shall be installed with the thermostatic expansion valve bulb located on top of the suction line when the suction line is less than 2-1/8 inches in diameter and at the 4 o'clock or 8 o'clock position on lines larger than 2-1/8 inches. The bulb shall be securely fastened with two clamps. The bulb shall be insulated. The bulb shall installed in a horizontalportion of the suction line, if possible, with the pigtail on the bottom. If the bulb must be installed in a vertical line, the bulb tubing shall be facing up.

3.01.4.3 Valve Identification

Each system valve, including those which are part of a factory assembly, shall be tagged. Tags shall be in alphanumeric sequence, progressing in direction of fluid flow. Tags shall beembossed, engraved, or stamped plastic or nonferrous metal of various shapes, sized approximately 1-3/8 inch diameter, or equivalent dimension, substantially attached to a component or immediately adjacent thereto. Tags shall be

attached with nonferrous, heavy

duty, bead or link chain, 14 gauge annealed wire, nylon cable bands or as approved. Tag numbers shall be referenced in Operation and Maintenance Manuals and system diagrams.

3.01.5 Vibration Dampers

Vibration damper shall be provided in the suction and discharge lines on spring mounted compressors. Vibration dampers shall be installed parallel with the shaft of the compressor and shall be anchored firmly at the upstream end on the suction line and the downstream endin the discharge line.

3.01.6 Strainers

Strainers shall be provided immediately ahead of solenoid valves and expansion devices.Strainers may be an integral part of an expansion valve.

3.01.7 Filter Dryer

A liquid line filter dryer shall be provided on each refrigerant circuit located such that all liquid refrigerant passes through a filter dryer. Dryers shall be sized in accordance with themanufacturer's recommendations for the system in which it is installed. Dryers shall be installed such that it can be isolated from the system, the isolated portion of the system evacuated, and the filter dryer replaced. Dryers shall be installed in the horizontal position except replaceable core filter dryers may be installed in the vertical position with the accessflange on the bottom.

3.01.8 Sight Glass

A moisture indicating sight glass shall be installed in all refrigerant circuits down stream of allfilter dryers and where indicated. Site glasses shall be full line size.

3.01.9 Discharge Line Oil Separator

Discharge line oil separator shall be provided in the discharge line from each compressor. Oilreturn line shall be connected to the compressor as recommended by the compressor manufacturer.

3.01.10 Accumulator

Accumulators shall be provided in the suction line to each compressor.

3.01.11 Flexible Pipe Connectors

Connectors shall be installed perpendicular to line of motion being isolated. Piping forequipment with bidirectional motion shall be fitted with two flexible connectors, in perpendicular planes. Reinforced elastomer flexible connectors shall be installed in

accordance with manufacturer's instructions. Piping guides and restraints related to flexibleconnectors shall be provided as required.

3.01.12 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein. Pipe hanger types 5, 12, and 26 shall not be used. Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Piping subjected to vertical movement, when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers andsupports or by constant support hangers.

3.01.12.1 Hangers

Type 3 shall not be used on insulated piping. Type 24 may be used only on trapeze hangersystems or on fabricated frames.

3.01.12.2 Inserts

Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustments may be used if they otherwise meet the requirements forType 18 inserts.

3.01.12.3 C-Clamps

Type 19 and 23 C-clamps shall be torqued in accordance with MSS SP-69 and have bothlocknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clampbodies or retaining devices are not acceptable.

3.01.12.4 Angle Attachments

Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.

3.01.12.5 Saddles and Shields

Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle, connected to the pipe, shall be used on all pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 40 shields shall beused on all piping less than 4 inches and all piping 4 inches and larger carrying medium less than 60 degrees F. A high density insulation insert of cellular glass shall be used under the Type 40 shield for piping 2 inches and larger.

3.01.12.6 Horizontal Pipe Supports

Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping.Pipe supports shall be spaced not over 5 feet apart at valves.

3.01.12.7 Vertical Pipe Supports

Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of notmore than 15 feet not more than 8 feet from end of risers, and at vent terminations.

3.01.12.8 Pipe Guides

Type 35 guides using, steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shallbe provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

3.01.12.9 Steel Slides

Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 4 inches and larger, a Type 39 saddle shall be used. Onpiping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate.

3.01.12.10 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shallnot exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

3.01.12.11 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safetyfactor not less than 5. Supports shall not be attached to metal decking. Masonry anchors for overhead applications shall be constructed of ferrous materials only. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section.

3.01.12 Pipe Alignment Guides

Pipe alignment guides shall be provided where indicated for expansion loops, offsets, and bends and as recommended by the manufacturer for expansion joints, not to exceed 5 feet on each side of each expansion joint, and in lines 4 inches or smaller not more than 2 feet on eachside of the joint.

3.01.13 Pipe Anchors

Anchors shall be provided wherever necessary or indicated to localize expansion or to preventundue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results using turnbuckles where required. Supports, anchors, or stays shall not be attached where they will injure the structureor adjacent construction during installation or by the weight of expansion of the pipeline.
Where pipe and conduit penetrations of vapor barrier sealed surfaces occur, these items shallbe anchored immediately adjacent to each penetrated surface, to provide essentially zero movement within penetration seal. Detailed drawings of pipe anchors shall be submitted forapproval before installation.

3.01.14 Building Surface Penetrations

Sleeves shall not be installed in structural members except where indicated or approved. Sleeves in nonload bearing surfaces shall be galvanized sheet metal, conforming to ASTM A653/A653M, Coating Class G-90, 20 gauge. Sleeves in load bearing surfaces shall be uncoated carbon steel pipe, conforming to ASTM A53/A53M, Standard weight. Sealants shall be applied to moisture and oil-free surfaces and elastomers to not less than 1/2 inch depth.
Sleeves shall not be installed in structural members.

3.01.14.1 Refrigerated Space

Refrigerated space building surface penetrations shall be fitted with sleeves fabricated from hand-lay-up or helically wound, fibrous glass reinforced polyester or epoxy resin with a minimum thickness equal to equivalent size Schedule 40 steel pipe. Sleeves shall be constructed with integral collar or cold side shall be fitted with a bonded slip-on flange or extended collar. In the case of masonry penetrations where sleeve is not cast-in, voids shall be filled with latex mixed mortar cast to shape of sleeve and flange/external collar type sleeve shall be assembled with butyl elastomer vapor barrier sealant through penetration to cold side surface vapor barrier overlap and fastened to surface with masonry anchors. Integral cast-in collar type sleeve shall be flashed with not less than 4 inches of cold side vapor barrier overlapof sleeve surface. Normally noninsulated penetrating round surfaces shall be sealed to sleeve bore with mechanically expandable seals in vapor tight manner and remaining warm and cold side sleeve depth shall be insulated with not less than inches of foamed-in-place rigid polyurethane or foamed-in-place silicone elastomer. Vapor barrier sealant shall be applied to finish warm side insulation surface. Warm side of penetrating surface shall be insulated beyond vapor barrier sealed sleeve insulation for a distance which prevents condensation.
Wires in refrigerated space surface penetrating conduit shall be sealed with vapor barrier plugs or compound to prevent moisture migration through conduit and condensation therein.

3.01.14.2 General Service Areas

Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Pipes passing through concrete or masonry wall or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall be of such size as to provide a minimum of 1/4 inch all-around clearance between bare pipe and sleeves or between jacketed-insulation and sleeves. Except in pipe chases or interior walls, theannular space between pipe and sleeve or between jacket over-insulation and sleeve shall be sealed.

3.01.14.3 Waterproof Penetrations

Pipes passing through roof or floor waterproofing membrane shall be installed through a 17 ounce copper sleeve, or a 0.032 inch thick aluminum sleeve, each within an integral skirt or flange. Flashing sleeve shall be suitably formed, and skirt or flange shall extend not less than 8 inches from the pipe and be set over the roof or floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 2 inches abovethe roof or floor penetration. The annular space between the flashing sleeve and the bare pipe or between the flashing sleeve and the metal-jacket-covered insulation shall be sealed as indicated. Penetrations shall be sealed by either one of the following methods.

a. Waterproofing Clamping Flange: Pipes up to and including 10 inches in diameter passing through roof or floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and pressure ring with brass bolts. Waterproofing membrane shall be clamped into place and sealant shallbe placed in the caulking recess.

b. Modular Mechanical Type Sealing Assembly: In lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve or conduit and sleeve, a modular mechanical type sealing assembly may be installed. Seals shall consistof interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, andpressure plates. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal rubber sealing elements to expand and provide a watertight seal between the pipe/conduit seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor electing to use the modular mechanical type seals shall provide sleeves of the proper diameters.

3.01.14.4 Fire-Rated Penetrations

Penetration of fire-rated walls, partitions, and floors shall be sealed as specified in Section 0784 00 FIRESTOPPING.

3.01.14.5 Escutcheons

Finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms, shall be provided with escutcheons. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.
Escutcheon shall be secured to pipe or pipe covering.

3.01.16 Access Panels

Access panels shall be provided for all concealed valves, vents, controls, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced.

3.01.17 Field Applied Insulation

Field installed insulation shall be as specified in Section 230713 INSULATION, except as defined differently herein.

3.02 CLEANING AND ADJUSTING

Clean uncontaminated system(s) by evacuation and purging procedures currently recommended by refrigerant and refrigerant equipment manufacturers, and as specified herein, to remove small amounts of air and moisture. Systems containing moderate amounts of air, moisture, contaminated refrigerant, or any foreign matter shall be considered contaminated systems. Restoring contaminated systems to clean condition including disassembly, component replacement, evacuation, flushing, purging, and re-charging, shall be performed using currently approved refrigerant and refrigeration manufacturer's procedures. Restoring contaminated systems shall be at no additional cost to the Government as determined by the Contracting Officer. Water shall not be used in any procedure or test.

3.03 REFRIGERANT PIPING TESTS

After all components of the refrigerant system have been installed and connected, subject the entire refrigeration system to pneumatic, evacuation, and startup tests as described herein.
Submit a schedule, at least 2 weeks prior to the start of related testing, for each test. Identify the proposed date, time, and location for each test. Conduct tests in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Provide all material, equipment, instruments, and personnel required for the test. Provide the services of a qualified technician, as required, to perform all tests and procedures indicated herein. Field tests shall be coordinated with Section 230593.2 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Submit 6 copies of the tests report in bound 8 1/2 by 11 inch booklets documenting all phases of the tests performed. The report shall include initial

test summaries, all repairs/adjustments made, and the final test results.

3.03.1 Preliminary Procedures

Prior to pneumatic testing, equipment which has been factory tested and refrigerant charged aswell as equipment which could be damaged or cause personnel injury by imposed test pressure, positive or negative, shall be isolated from the test pressure or removed from the system. Safety relief valves and rupture discs, where not part of factory sealed systems, shall be removed and openings capped or plugged.

3.03.2 Evacuation Test

Following satisfactory completion of the pneumatic tests, the pressure shall be relieved and theentire system shall be evacuated to an absolute pressure of 300 micrometers. During evacuation of the system, the ambient temperature shall be higher than 35 degrees F. No morethan one system shall be evacuated at one time by one vacuum pump. Once the desired vacuum has been reached, the vacuum line shall be closed and the system shall stand for 1 hour. If the pressure rises over 500 micrometers after the 1 hour period, then the system shall be evacuated again down to 300 micrometers and let set for another 1 hour period. The system shall not be charged until a vacuum of at least 500 micrometers is maintained for a period of 1 hour without the assistance of a vacuum line. If during the testing the pressure continues to rise, check the system for leaks, repair as required, and repeat the evacuation procedure. During evacuation, pressures shall be recorded by a thermocouple-type, electronic-type, or a calibrated-micrometer type gauge.

3.03.3 System Charging and Startup Test

Following satisfactory completion of the evacuation tests, the system shall be charged with therequired amount of refrigerant by raising pressure to normal operating pressure and in accordance with manufacturer's procedures. Following charging, the system shall operate with high-side and low-side pressures and corresponding refrigerant temperatures, at design or improved values. The entire system shall be tested for leaks. Fluorocarbon systems shall be tested with halide torch or electronic leak detectors.

3.03.4 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of thesystem shall immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances shall therefrigerant be discharged into the atmosphere.

3.03.5 Contractor's Responsibility

At all times during the installation and testing of the refrigeration system, take steps to preventthe release of refrigerants into the atmosphere. The steps shall include, but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for

reuse or reclaim. At no time shall more than 3 ounces of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year shall be repaired inaccordance with the requirements herein at no cost to the Government including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

END OF SECTION 232300

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SECTION 233113 - AIR DISTRIBUTION DUCTWORK SYSTEM

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 STANDARDS: Install ductwork in accordance with best standard practices as described in the SMACNA Low Velocity Duct Manual. Keep copy of SMACNA Low Velocity Duct Manualon the job site at all times during construction.

PART II - PRODUCTS

2.01 SHEET METAL - RECTANGULAR

A) Ductwork, unless otherwise noted, shall be galvanized sheet metal (weight of zinc coating shall be equal to G90) and shall be built as required by HVAC Duct Construction Standards, Metal and Flexible, First Edition, January, 1985, and diagrammatically shown on the drawings.

B) Ductwork 18 in. width and over shall be cross-broken, or ribbed and stiffened, so that it willnot "breathe," rattle, vibrate, or sag.

C) Curved elbows shall have a throat radius equal to the duct width. Provide splitter vane(s) inradius elbows where indicated on drawings.

D) Square elbows shall have double-thickness turning vanes, unless single-thickness vanes areclearly indicated on the drawings.

E) Transitions in ductwork shall be made with a slope not exceeding 1 to 5, preferable 1 to 7.

F) Supply duct splits shall be provided with splitter damper and adjustable locking quadrant.Splitter blade shall be 1.5 times the smaller split width.

G) Supply duct takeoffs shall include either an adjustable air-turning device equal to Carnes No.1250 Variturn Model 2, 3, or 4 or a bellmouth scoop and a balancing damper with locking quadrant and handle.

2.02 SHEET METAL - ROUND

A) Round sheet metal duct shall be constructed as required in HVAC Duct Construction Standards as published by SMACNA and referred to above. Low-pressure duct may be shop-

fabricated, using good practice. Medium- and high-pressure duct shall be a manufactured product by a firm regularly engaged in such work and with a catalog listing construction, weight,Specifications, and pressure losses. Flat oval shall be same as medium- pressure duct above.

B) Round duct insulated internally shall be a product of a manufacturer engaged in suchproduction and shall have an internal perforated liner equal to United Acousti K-27.

C) Flat oval duct insulated internally shall be same as "b" above. Flat oval duct may be used inplace of round or rectangular duct, provided the insulation thickness specified, and diffuser neckshall be rectangular to match duct.

2.03 AUXILIARY EQUIPMENT

A) Duct reinforcing, hangers, and other ferrous metals used in the duct system shall begalvanized as required for the ductwork by SMACNA Standards.

B) Provide connector to the inlet and outlet of air handling equipment with flexible connectionsnot less than 4" long made of neoprene-impregnated glass fabric. Provide two bare 1/2" wide braided copper jump wires across each flexible connection and securely bolt to duct on each sideof flexible connection.

C) Duct connectors up to 8 inch diameter shall be minimum Class 2 materials and greater than 8inch diameter shall be minimum Class 1 materials.

D) GRILLES, REGISTERS AND DIFFUSERS:

1. Ceiling supply air diffusers: Metal-Aire, Carnes, Titus, Krueger or equal with controlgiven in schedule.

2. Ceiling return and exhaust air registers: Metal-Aire, Carnes, Titus, Krueger or equalwith control and finish given in schedule.

E) EXHAUST FANS:

1. Nutone, Greenheck, Carnes, Penn or approved equal of the type, size and capacityindicated in schedule.

2.04 ACCEPTABLE MANUFACTURERS' CRITERIA

A) Duct splitter dampers equivalent to Young Regulator Co., Barber Coleman, Carnes, or Hartand Cooley.

B) Spiral duct equivalent to Young Regulator Co., or United Sheetmetal Div.

C) Turning devices equivalent to Carnes, Barber Coleman, or Hart and Cooley.

D) Supply duct takeoffs shall include:

1. (For round ducts) a bellmouth scoop and a balancing damper with locking guadrant and handle; air volume control is to be designed to be mounted on the main trunk with an air-tight neoprene gasket and constructed of heavy gauge galvanized steel,

2. (For rectangular ducts) an adjustable air-extractor, having a manual push-pull adjustingarm, with vanes parallel to short side of extractor; secure operator arm to duct after balancing operation is completed.

3. Takeoffs to be equivalent to United Enertech, Metal-Aire or Titus.

PART III - EXECUTION

3.01 INSTALLATION

A) Install all ductwork generally as shown on the drawings and as required by SMACNAmanual. All shown dimensions are "net inside" dimensions.

B) Ductwork shall have all joints and laps sealed with mastic equal to Hardcast DT-5300 to ensure a completely airtight duct system. All closure materials shall have a flame spread ratingof not over 25 and a smoke-developed rating o not over 50 when tested in accordance with ASTM 84.

3.02 BALANCING AND ADJUSTING: SEE SECTION 230593.20.

END OF SECTION 233113

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SECTION 233116 - INSULATED FLEXIBLE DUCTWORK LOW PRESSURE

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 FLEXIBLE DUCTS

A) Flexible air ducts shall have impervious inner core with wire reinforcement. The inner ductshall be covered with 1.5 in. fiberglass insulation with a polyethylene vapor-proof jacket.

B) Flexible air duct shall be UL-181-listed, Class 1, and shall meet all local codes.

C) Adjustable stainless steel or nylon straps shall be used to secure duct fittings and equipment.A second band shall be applied over the jacket to maintain the vapor barrier.

D) Fittings to connect the flex duct to the trunk duct shall be designed to attach to the trunk ductwith an air-tight neoprene gasket and shall have a volume control balancing damper and a bellmouth scoop.

2.02 ACCEPTABLE MANUFACTURERS

A) Duct shall be the product of an established manufacturer of such products and equivalent toCertain Teed (Model G-25), Wiremold (GGC), P.P.G. (Gloss Flex).

PART III - EXECUTION

3.01 INSTALLATION

A) Flexible duct shall be limited in length to that necessary to make connections between trunkducts and terminal units. This shall normally not exceed 4 ft.

B) All duct shall be fully stretched out to reduce resistance.

C) Connections to fittings or terminals shall be made with stainless steel bands. The inner linershall be clamped tight with the band, then the insulation and jacket pulled up tight against the duct or terminal and secured with a second band of strap. Installation shall be as recommended by the duct manufacturer.

D) Support the flexible duct with adequate hangers to relieve strain on any fitting. Unnecessarybends, sags, twists, etc., will not be allowed.

END OF SECTION 233116

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SECTION 233300 - DUCTWORK ACCESSORIES

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included asa part of this Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 REFERENCES

A) NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B) SMACNA - Low Pressure Duct Construction Standards.

C) UL 33 - Heat Responsive Links for Fire-Protection Service.

D) Ul 555 - Fire Dampers and Ceiling Dampers.

1.04 SUBMITTALS

A) Provide shop drawings for shop fabricated assemblies indicated, including volume controldampers, duct access doors and duct test holes. Provide product data for hardware used.

B) Submit manufacturer's installation instructions for fire dampers and combination fire andsmoke dampers.

PART II - PRODUCTS

2.01 VOLUME CONTROL DAMPERS

A) Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and asindicated.

B) Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction,and two gages heavier for sizes over 24 inches.

C) Fabricate splitter dampers of [single] [double] thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in selfaligning, universal joint action flanged bushing with set screw.

D) Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

E) Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72inch. Assemble center and edge crimped blades in prime coated or galvanized channel framewith suitable hardware.

F) Except in round ductwork 12 inches and smaller, provide end bearings. In multiple bladedampers, provide oil-impregnated nylon or sintered bronze bearings.

G) Provide locking, indicated guadrant regulators on single and multi-blade dampers. Whererod lengths exceed 30 inches provide regulator at both ends.

H) On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, oradapters.

E) Electro Thermal Link: Fusible link which melts when subject to local heat of [165] [] degrees F and from external electrical impulse; UL listed and labeled.

2.02 BACKDRAFT DAMPERS

A) Gravity backdraft dampers, furnished with air moving equipment, may be air movingequipment manufacturers standard construction.

B) Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gage galvanized steel, or extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ballbearings, and plated steel pivot pin.

2.03 AIR TURNING DEVICES

A) Multi-blade device with blades aligned in short dimension; steel or aluminum construction;with individually adjustable blades, mounting straps.

2.04 FLEXIBLE DUCT CONNECTIONS

A) Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and asindicated.

B) UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimumdensity 20 Zz per sq yd, approximately 3 inches wide, crimped into metal edging strip.

C) Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to10,000 Hz range.

PART III - EXECUTION

3.01 INSTALLATION

A) Install accessories in accordance with manufacturer's instructions.

B) Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampersonly where indicated.

C) Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and whereindicated.

D) Provide flexible connections immediately adjacent to equipment in ducts associated withfans anD motorized equipment.

END OF SECTION 233300

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SECTION 233423 - CABINET-TYPE CENTRIFUGAL FAN - DIRECT DRIVEN

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000 are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 FAN AND CABINET

A) Cabinet fan shall consist of direct-shaft-driven centrifugal fan(s) mounted in an insulated enclosure. Fan and motor shall be isolated by rubber supports to reduce noise. Provide back-draft damper in outlet.

B) Capacity shall be as shown on drawings with Sone level as shown or no greater than modelcalled out. Capacity and sound level shall be AMCA-rated with UL Label.

2.02 AUXILIARY EQUIPMENT

A) Speed control shall be provided by solid-state speed control furnished by the fanmanufacturer.

B) Provide duct and grille adapters, as are standard with the cabinet fan.

2.03 ACCEPTABLE MANUFACTURERS

A) Cabinet fans shall be the model number shown on the drawings or approved equivalent fanby Penn, Loren Cook or Greenheck.

PART III - EXECUTION

3.01 INSTALLATION

A) Install cabinet fan on vibration isolators as specified under that section.

B) Connect ductwork with flexible connections that are not under any strain and do not have airleaks.

C) This system is not complete until the system has been balanced to provide the correct airquantity and has been tested to demonstrate the correct system performance.

END OF SECTION 233423

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SECTION 233713 - GRILLES, REGISTERS, AND DIFFUSERS

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 GRILLES, REGISTERS, AND DAMPERS

A) Grilles, registers, and diffusers shall be style and type listed below. Select for proper throwand drop for air quantity and size shown on drawings. Maximum noise shall be 32 dB ("a" scale).

B) Not all of the types listed below are required on every job. Refer to drawings for type andsize.

2.02 ACCEPTABLE MANUFACTURERS

A) Acceptable manufacturers' name is given in Section 233113 and the drawing schedules. Other manufacturers' products are acceptable, as approved by the engineer.

2.03 REVERSIBLE CORE REGISTERS (WALL OR SILL)

A) Extruded-aluminum core with blades on 1/4-in. spacing shall be mounted in an extruded-aluminum frame with borders 1 1/4 in. or 3/4 in. wide.

B) Core shall be removable and reversible to provide for 5 or 15 deg. of spread.

C) Provide concealed rear blades for deflection.

D) Provide extruded-aluminum opposed blade dampers (OBD).

2.04 CEILING RETURN AND EXHAUST REGISTERS

A) Extruded-aluminum natural color OBD, maximum velocity of 500 fpm, maximum pressuredrop of 0.l in. sp.

B) Egg-crate type - 1/2 x 1/2 x 1/2 in. blades in extruded-aluminum frame for surface mounting,90% free area.

C) Angle blade type - extruded-aluminum blades on 3/4-in. spacing in extruded frame forsurface mounting, 70% free area.

D) Straight blade type - extruded-aluminum blades on 1/2-in. spacing in extruded-aluminumframe for surface mounting, 70% free area.

PART III - EXECUTION

3.01 INSTALLATION

A) Install all grilles, registers, and louvers flush with surface and level or straight with othersimilar items.

B) Insulate the back of all ceiling diffusers, to cover all exposed metal, with 1/4-in. thickness ofself-adhesive insulating tape.

C) Drop from supply duct shall be internally insulated down to diffuser. If necessary, cut insulation back to clear operation of the OBD damper and reinsulate only the exposed portionwith external duct insulation.

D) Support the register from the duct at the proper level to hold it snug against the ceiling.

END OF SECTION

SECTION 236313.13 – STANDARD AIR-CONDITIONING & HEAT PUMP AIR-HANDLING UNIT

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 AIR-HANDLING UNIT

A) Air-handling unit shall be designed for the moving and conditioning of air in air conditioning, heating, and ventilation systems. The equipment shall consist of a steel casing consisting of filter section, coil section and fan section including the fan, fan drive, and motor.The unit shall be equal to that shown on the drawings with capacity not less than that shown.

2.02 CASING

A) Casing shall be fabricated from steel, braced to produce a rigid assembly composed of prefabricated sections. All metals in the casing shall be given a rust-preventative treatment afinish coat of baked enamel.

B) Cabinets shall be of heavy gauge galvanized steel. The interior side of the cabinet shall beinsulated with ½" neoprene-backed acoustical insulation.

C) Service Panels shall be easily removable and sufficiently large to allow access to allcomponents.

D) All connections to the casing shall be made with flexible connectors in ductwork and piping.

E) Casing shall be for a horizontal or vertical unit.

2.03 REFRIGERANT CIRCUIT

A) The evaporator coil shall be compatible with the specified condensing unit & include allcontrols necessary to control the refrigerant circuit.

B) Sealed refrigerant circuit shall be certified for 450 psig working pressure.

2.04 ELECTRICAL

A) Incoming power shall be routed through a factory installed K.O. connection within unitcontrol panel.

2.05 FAN MOTOR

A) The fan motor shall be selected for the power required to deliver the supply air quantity against a system static pressure shown on the schedule without overloading. Selection of motorshall not consider the overload rating of the motor.

B) Fan motors for air-handling units mounted in the condition space shall be provided withresilient mounting to reduce the motor noise.

C) Fan motors shall be either variable speed, direct drive, multi speed direct drive or singlespeed belt drive as indicated on the schedule.

2.06 WARRANTIES, STANDARD AND EXTENDED:

A) Units shall be warranted against any and all defects in material and workmanship for a periodof one year from date of original installation. This warranty covers repairs or replacement of defective parts which shall be returned, transportation charges prepaid, to manufacturer for examination and determination as to liability.

2.07 FACTORY START-UP

A) Manufacturer shall provide factory check-out and start-up of each unit. Upon completion of installation, and receipt of readiness report from Contractor, the manufacturer shall provide supervision for start-up.

B) Upon completion of start-up, a report shall be submitted to the designer for approval.

2.08 ACCEPTABLE MANUFACTURERS

A) The evaporator blower section shall be the make and model shown on the drawings orequivalent models by Lennox, Trane, or McQuay.

PART III - EXECUTION

3.01 EQUIPMENT INSTALLATION:

A) The Manufacturer's authorized agent shall be responsible for proper installation of this equipment. This includes proper control and power wiring supervision, mounting instructions,

pipe and ductwork connections, and all other required specialties. His agent shall be responsiblefor start up and final checkout. He shall, upon job completion, notify the owner and Designer in writing that the equipment has been checked out, and is operating properly and satisfactory in every respect.

END OF SECTION 236313.13

SECTION 238127 – DUCTLESS SPLIT-SYSTEM AIR-CONDITIONERS

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

1.03 SUMMARY

A) Section includes:
1) Fan coil unit.
2) Condensing unit.
3) For units/systems up to three tons maximum.

1.04 REFERENCES

A) Air-Conditioning and Refrigeration Institute:

1) ARI-210/240 – Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
2) ARI 270 – Sound Rating of Outdoor Unitary Equipment.
3) ARI 340/360 – Commercial and Industrial Unitary Air-Conditioning and Heat PumpEquipment.
4) ARI 365 – Commercial and Industrial Unitary Air-Conditioning Condensing Units.

B) American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1) ASHRAE 52.1 – Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning devices Used in General Ventilation for Removing Particulate Matter.
2) ASHRAE 90.1 – Energy Standard for Buildings except Low-Rise Residential Buildings.

C) ASTM International:

1) ASTM B117 – Standard Practice for Operating Salt Spray (fog) Apparatus.

D) National Electrical Manufacturers Association:

1) NEMA MG 1 – Motors and Generators.

E) National Fire Protection Association:

1) NFPA 90-A – Standard for the Installation of Air Conditioning and Ventilating Systems.

1.03 SUBMITTALS

A) Product Data: Submit data indicating:

1) Cooling and heating capacities.
2) Dimensions.
3) Weights.
4) Rough-in connections and connection requirements.
5) Electrical requirements with electrical characteristics and connection requirements.
6) Controls.
7) Accessories.

B) Manufacturer's Installation Instructions: Submit assembly, support details, connectionrequirements, and include start-up instructions.

1.04 QUALITY ASSURANCE

A) Performance Requirements: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE 90.1 when used in combination withcompressors and evaporator coils when tested in accordance with ARI Standards.

PART II – PRODUCTS

2.01 SPLIT SYSTEM AIR CONDITIONING UNITS

A) Product Description: Split system consisting of fan coil unit and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, airfilters, controls air handling unit accessories, condensing unit accessories and refrigeration specialties.

B) Manufacturers:

1) Mitsubishi.
2) Daikin.
3) Trane.

C) Refrigerants R-410A and R-407C.

2.02 FAN COIL UNIT

A) Cabinet:

1) Panels: Constructed of galvanized steel with baked enamel finish.
Access Panels: Located on both sides of unit. Furnish with duct collars on inlets andOutlets.
2) Insulation: Factory applied to each surface to insulate entire cabinet. One inch thick neoprene coated aluminum foil faced glass fiber with edges protected from erosion.

B) Evaporator Fan: Forward curved centrifugal type, resiliently mounted with adjustable beltdrive and high efficiency motor. Motor permanently lubricated with built-in thermal overloadprotection.

C) Evaporator Coil: Constructed of copper tubes expanded onto copper fins. Factory leak tested under water. Removable, PVC construction, double-sloped stainless steel drain pan with piping connections on both sides. Coil shall be coated with minimum 1.0 mil. Aluminum impregnated polyurethane coating by Blygold PoluA1 XT or approved equal. Coating shall withstand 4,000 hours in both salt spray test per ASTM B117 and acid salt spray test per ASTMD5339.

D) Refrigeration System: Single or Dual refrigeration circuits controlled by factory installedthermal expansion valve. Refrigerant shall be R407C or R410A.

E) Air Filters: permanent.

F) Unit shall be wall mounted, ceiling mounted, or ceiling cassette type (integral with grid).

2.03 CONDENSING UNIT

A) General: Factory assembled and tested air cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls.

B) Unit Casings: Exposed casing surfaces constructed of galvanized steel with manufacturer's standard baked enamel finish. Designed for outdoor installation and complete with weather protection for components and controls and complete with removable panels for required accessto compressors, controls, condenser fans, motors, and drives.

C) Compressor: Single refrigeration circuit or two independent refrigeration circuits with rotaryor hermetic semi-hermetic reciprocating type compressors, resiliently mounted, with positive lubrication, and internal motor overload protection. Compressor shall have a five (5) year warranty.

D) Condenser Coil: Constructed of copper tubing mechanically bonded to copper fins, factory leak and pressure tested. Coil shall be coated with minimum 1.0 mil. Aluminum impregnated polyurethane coating by Blygold PoluA1 XT or approved equal. Coating shall withstand 4,000hours in both salt spray test per ASTM B117 and acid salt spray test per ASTM D5339.

E) Controls: Furnish operating and safety controls including high and low pressure cutouts. Control transformer; Furnish magnetic contactors for compressor and condenser fan motors.

F) Condenser Fans and Drives: Direct drive propeller fans statically and dynamically balanced. wired to operate with compressor. Permanently lubricated ball bearing type motors with built-in thermal overload protection. Furnish high efficiency fan motors.

G) Condensing Unit Accessories: Furnish the following accessories:

1) Controls to provide low ambient cooling to 0 degrees F.
2. Time delay relay.
3. Anti-short cycle timer.
4. Disconnect switch.
5. Vibration isolators.
6. Coil with corrosion resistant coating capable of withstanding salt spray test of 1000 hoursin accordance with ASTM B117.

H) Refrigeration specialties: Furnish the following for each circuit:

1) Charge of compressor oil.
2) Holding charge of refrigerant.
3) Replaceable core type filter drier.
4) Liquid line sight glass and moisture indicator.5 Liquid line solenoid valve.
6) Charging valve.
7) Pressure relief device.

PART III – EXECUTION

3.01 INSTALLATION – FAN COIL UNIT

A) Install per manufacturer's recommendations. Where appropriate, provide 2" deflectionspring vibration isolators and seismic restraints.

B) Install condensate piping with trap and route from drain pan to approved receptor.

END OF SECTION 238127

SECTION 238239 - ELECTRIC CEILING/WALL MOUNTED HEATER - COMMERCIALTYPE

PART I - GENERAL

1.01 The GENERAL and SPECIAL CONDITIONS, Section 230000, are included as a part ofthis Section as though written in full in this document.

1.02 Scope of the Work shall include the furnishing and complete installation of the equipmentcovered by this Section, with all auxiliaries, ready for owner's use.

PART II - PRODUCTS

2.01 ELECTRIC CEILING/WALL MOUNTED HEATER

A) Electric heater shall be a commercial-grade heater for mounting at or near the ceiling, withenclosed finned element, quiet-type fan, and motor with heavy cabinet. Capacity shall be as shown on the drawings. Heater shall be UL-listed.

B) Heating element shall be totally enclosed, corrosion-resistant finned type with wide finspacing, having a density of 60 watts per inch maximum.

C) Fan and motor shall be slow-speed, the same voltage as the heater. Motor shall bepermanently lubricated.

D) Controls shall consist of a thermal high-limit cutout that is reset by turning the heater off for5 min. A wall-mounted line voltage thermostat shall be provided for small-capacity heaters. A low-voltage wall thermostat with contactor shall be provided for heaters of higher capacity.

2.02 ACCEPTABLE MANUFACTURERS

A) Acceptable manufacturers shall include the make and model number shown on the drawingsor equivalent heaters by Nutone Markel. Brasch or REDDI.

PART III - EXECUTION

3.01 INSTALLATION

A) Surface-mounted heaters shall be securely fastened to the structure at/above the location, andflush-mounted heaters shall be mounted in the ceiling support T-bar system, with additional hangers to support the weight.

B) Provide electrical connections for power and controls as required by code and recommendedby the manufacturer.

C) Place the heater in operation and check controls and heater for proper operation.

END OF SECTION 238239

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SECTION 260000 - GENERAL ELECTRICAL

PART I - GENERAL

1.01 OTHER CONDITIONS

A) Applicable provisions of the General conditions, Supplementary Conditions, and Division 1,General Requirements, apply to the work under this Section.

1.02 SCOPE OF WORK:

A) The work included under this specification consists of, but is not limited to, work as indicated on the drawings and hereinafter specified in Division 26. Without limiting the generality implied by the drawings and specifications, electrical installation consists of furnishing all materials, accessories, tools, and labor required and incidental thereto, to provide:

1. Lighting fixtures and lamps.

2A system of conduit and new conductors to supply electricity throughout the building.

3. Panelboards, wiring devices, etc.

4. Temporary wiring to be used during construction.

5.Wiring in connection with heating, ventilating, and

plumbing.6.General grounding components.

7.Other work as depicted on design drawings.

1.03 RELATED WORK:

A) Mechanical work is specified under Division 23.

B)See drawings and other sections for equipment requiring electrical service.

C)Painting (except factory-applied finishes on equipment) is specified elsewhere.

1.04 REFERENCE STANDARDS:

A) Make entire electrical installation in strict accordance with the requirements of all city, county, state, or federal codes of law having jurisdiction, the requirements and recommendationsof the Board of Fire Underwriters, including all amendments and/or additions to said codes, laws, requirements, and recommendations and the requirements and recommendations of the Utility Company.

B) Should any work shown on the drawings or herein specified be construed as being contrary

to or not conforming to the previously mentioned codes, etc., bring it to the attention of theArchitect before executing the work in conformity with the various codes, etc., without additional cost to the Owner, but not until the matter in question has been reviewed by the Architect.

C) Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications inexecuting the work shall prevail.

D) File with proper authorities all necessary drawings as required by various codes, laws,ordinances, or other requirements.

E) Obtain and pay for all permits and for all required inspection certificates. Pay necessaryfees.

1.05 WARRANTY - GUARANTEE

A) Warrant and guarantee that all work executed under this section of the specifications will befree from defects of materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties further agree that they will, at their own expense,repair and replace all such defective work and all other work damaged thereby which defective during the term of the warranty-guarantee.

1.06 ARCHITECTURAL DRAWINGS:

A) Refer to architectural drawings for details such as finishes, dimensions, materials, etc. Refer to drawings for door locations, door swings, partitions location, cabinet and counters, making proper allowances therefore. Refer to equipment plans for exact location of electricalconnections which are dimensioned.

PART II - PRODUCTS

2.01 SUBMITTALS:

A) Manufacturer's Data: For information only, submit 6 copies of manufacturer's specifications, descriptions, illustrations, and installation instructions for each type of manufactured product to include: Lighting fixtures, lamps, panelboards, exit signs, wiring devices, emergency power for lighting, transformers, disconnect switches, grounding components, and fire alarm system components intended for use on this project. The submittalshall consist of one or more brochures each containing only "one" copy of material describing the product. Several products may be included in each brochure.

B) Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributedto the installer.

C) Furnish three complete sets of operating and maintenance instructions applying to

equipment installed in conjunction with this contract; include parts lists, wiring diagrams, catalogdata, stamped approval submittal data, and operational check-out data as called for in these specifications, bound in hardback binders. Instructions shall be submitted to the Architect for approval at least one month in advance of initial system start-up.

2.02 PRODUCTS

A) Materials shall not be ordered until architect's review of submittal material has been made.They shall be new and unused and the manufacturers standard product and the latest designs.

PART III - EXECUTION

3.01 INSTALLATION

A) The electrical drawings which show the work included are diagrammatic only; the locations, routing, etc., of the various fixtures, items of equipment, wiring, etc., are approximate only. The entire installation is subject to such deviations, modifications, rerouting, etc., as may be necessary to meet the requirements of the architectural, structural, and other drawings; and also as necessary to obtain a proper coordination of the work with that of all other trades.

B) Carefully check and become familiar with the above-mentioned drawings, and frequentlyconsult with all other trades so that the work may proceed in a harmonious manner.

C) Install all concealed wiring except where the Architect grants specific permission to runwiring exposed.

D) Installer shall defer the installation of all electrical fixtures liable to damage. After fixturesare permanently installed, completely protect against breaking, damage or the depositing of any waste material therein until the system is accepted.

3.02 COORDINATION

A) Carefully check locations, layouts, and dimensions of all items to be installed under thissection with the above-mentioned drawings, and coordinate with all trades affected.

B) Any work installed without properly checking and coordinating same as above provided,which as a result interferes with the proper installation of the work of other trades, is to be removed and properly reinstalled without additional cost to the owner.

C) It is the installer's responsibility to notify well in advance, all trades affected, of any chases, recesses, etc., which may be required for the installation of the electrical work. Should this be neglected, any cutting and/or patching required for such chases, recesses, etc., is to be done at thecontractor's expense.

D) Carefully examine all architectural, structural, plumbing, heating, electrical, and

other drawings; and other sections of the specifications for items, equipment, etc., not part of the electrical contract which may require electrical connections. Unless explicitly indicated to the

contrary, furnish and install all necessary electrical lines, boxes, etc., and make final connectionsto all such items, equipment, etc.

3.03 PROTECTION AND CLEANING

A) Protect work, fixtures, and materials at all times. Tightly cover and protect equipmentagainst dirt, water, chemical, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in a perfect unblemished condition.

B) Touch-up all damaged paint surfaces on equipment to match original paint.

3.04 TEMPORARY WIRING

A) As soon as practicable, install temporary wiring and lighting throughout the building. There shall be one pigtail lampholder for each 600 square feet of floor space or fraction thereof and in addition install a plug receptacle for each room having at least 200 square feet of space. There shall be one light in each room of 50 square feet or larger. Each pigtail outlet shall be equipped with a 100-watt lamp and replacement made immediately upon burnout or theft. Locate lights, as per above, on 25 feet center; install a temporary panelboard with not more than eight outlets, lights or receptacles on a circuit. Temporary wire shall consist of plastic type non-metallic type sheathed cable having a ground wire to which all the receptacle ground poles shall be connected. Receptacles shall have "ground-fault" protection.

3.05 WORK IN CONNECTION WITH MOTORS

A) Check rotation and connect for proper rotation, check overload heater element furnishedwith starters against nameplate rating or motor and code, call attention to improper sizes to mechanical contractor and architect. Electrical contractor shall verify that all motors are equipped with vendor supplied overload devices. Connect all motors with a short length of flexible conduit utilizing the proper type conduit connector. Connect all motors and controls completely, neatly, orderly, and properly tagged to proper operation of system involved.

3.06 WORK IN CONNECTION WITH THE MECHANICAL EQUIPMENT

A) Furnish and install all conduit and wiring necessary for the power supply of plumbing and heating, ventilating and air conditioning equipment. All starters, overload devices, and control devices will be furnished with the equipment with which they operate and they shall be installedas a part of the electrical work. Furnish and install disconnect switches with the motors where required by the National Electric Code. Refer to the plumbing, heating, and air conditioning drawings and specifications.

3.07 SERVICE TO EQUIPMENT

A) Check service required by equipment prior to making final connections. Call differences toattention of Architect. Check equipment for proper protective devices and safety devices to allow proper operation of equipment and prevent burnout. Assist owner in initial operation of equipment an make necessary adjustment for proper

operation.

3.08 INITIAL OPERATION OF EQUIPMENT

A) Give all equipment furnished in the contract an operational test prior to final acceptance. Assist the Owner in the initial operation when the owner operates the building and equipment. Instruct the owner's personnel in the proper operation and maintenance of all the equipment furnished under this section of the specifications.

3.09 PROTECTION OF ROOF

A) Coordinate electrical work with roofing work in regard to any electrical items which may pierce or otherwise affect the roof. Hold consultation well in advance of the installation of the final roofing and allow sufficient time for the roofing work to be prepared for the electrical work.

B) Arrange for any cutting or repairing to roofing which might already be installed when an electrical installation is made. See roofing specification for roofing with relation to work of other trades piercing the roof. If necessary consultation is not held, any roof repairs necessitatedby the electrical installation shall come under the scope of the work under this section.

3.10 FIRE RATED WALL PENETRATIONS

A) Where conduit penetrates fire-rated walls, the space between the penetration item and the fire barrier wall shall be properly protected. The space adjoining the conduit penetration shall be filled with material capable of maintaining the fire rating of the fire barrier, or it shall be protected by an approved device designed for this specific purpose. Where penetrating sleeves are used, the sleeves shall be solidly set in this fire barrier wall, and the space between the conduit and the sleeve shall be filled with material capable of maintaining the fire resistance of the fire-rated wall. All fire rated wall penetrations shall be installed in a manner that will provide an Underwriters Laboratories (UL) listed penetration assembly.

3.11 PANELBOARDS

A) Provide panelboards with molded case circuit breakers. Provide handle locking attachments for all circuit breakers serving emergency lights, exit lights, clocks, and other functions indicated. Where lighting is controlled from panelboard, provide handle lockingattachments for all circuit breakers other than those for lights. Provide handle padlock attachment for breakers feeding outside lighting.

B. Refer to cable sizes on single line diagram for size and configuration of lugs. Refer topanel summary schedule on drawings for requirements such as main breakers, shunt trip, auxiliary contacts, and other accessories and modifications.

C. Use panelboard with ground bus where cable wiring is used, where separate groundingconductor is used, and elsewhere as indicated. Keep ground bus insulated from neutral bus. Bond ground bus to panelboard cabinet.

END OF SECTION 26000

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SECTION 260001 - CONNECTION TO EQUIPMENT FURNISHED BY OTHERS

PART I - GENERAL

1.O1 WORK INCLUDED

A) Electrical connections to equipment specified under other Sections or furnished by Owner.

1.02 RELATED WORK

A) Owner-furnished equipment.

B) Motors

C) Section 16111 - Conduit

D) Section 16120 - Wire and Cable

E) Section 16130 -

BoxesPART II -

PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - CORDS AND CAPS

A) HUBBELL

B) LEVITON

C) PASS & SEYMOUR

2.02 CORDS AND CAPS

A) Attachment Plugs: NEMA WD 6.

B) Attachment Plug Configuration: Match receptacle configuration at outlet provided forequipment.

C) Cord Construction: Oil-resistant thermoset insulated Type 'SO' multiconductor flexible cordwith identified equipment grounding conductor, suitable for hard usage in damp locations.

D) Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrentprotection.

PART III - EXECUTION

3.01 INSPECTION

A) Verify that equipment is ready for electrical connection, wiring, and energization.

B) Verify that all motors are supplied with vendor supplied overload devices.

3.02 PREPARATION

A) Review equipment submittals prior to installation and electrical rough-in. Verify location, size,and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

A) Use wire and cable with insulation suitable for temperatures encountered in heat-producingequipment.

B) Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduitin damp or wet locations.

C) Install pre-finished cord set where connection with attachment plug is indicated or specified, oruse attachment plug with suitable strain-relief clamps.

D) Provide suitable strain-relief clamps for cord connections to outlet boxes and equipmentconnection boxes.

E) Make wiring connections in control panel or in wiring compartment of pre-wired equipment inaccordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F) Install disconnect switches, controllers, control stations, and control devices such as limitswitches and temperature switches as indicated. Connect with conduit and wiring as indicated.

END OF SECTION
260001

SECTION 260526 - SECONDARY GROUNDING

PART I - GENERAL

1.01 WORK INCLUDED

A) Power system grounding.

B) Communication system grounding.

C) Electrical equipment and raceway grounding and bonding.

D) Static grounding.

1.02 SYSTEM DESCRIPTION

A) Ground the electrical service system neutral at service entrance equipment to metallic waterservice and to supplementary grounding electrodes.

B) Ground each separately-derived system neutral to separate grounding electrode.

C) Provide communications system grounding conductor at point of service entrance and connect toseparate grounding electrode.

D) Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways andcables, receptacle ground connectors, and plumbing systems.

1.03 SUBMITTALS

A) Submit shop drawings under provisions of Section 260000.

B) Indicate location of system grounding electrode connections, and routing of grounding electrodeconductor.

PART II - PRODUCTS

2.01 MATERIALS

A) Ground Rods: Copper-encased steel, 3/4 inch (19 mm) diameter, minimum length 10 feet.

PART III - EXECUTION

3.01 INSTALLATION

A) Provide a separate, insulated equipment grounding conductor in feeder and branch circuits.

Terminate each end on a grounding lug, bus, or bushing.

B) Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around watermeter.

C) Supplementary Grounding Electrode: Use driven ground rod(s) in main service equipment area. Install rods in a triangle pattern, 10 ft. (minimum) apart.

D) Use minimum 6 AWG copper conductor for communications service grounding conductor. Leave 10 feet (3 m) slack conductor at terminal board.

E) Isolated Grounding Systems: Use insulated equipment grounding conductor and connect only to separate grounding electrode(s).

F) Provide grounding and bonding at Utility Company's metering equipment and pad-mounted transformer in accordance with Section 16420.

G) Provide grounding in accordance with requirements of NEC Article 250. Refer to grounding standards of local electrical utility company.

H) Provide a reliable low impedance metallic ground path for short circuit currents, so that circuit protective devices can operate quickly and effectively. Route the ground path parallel to the circuit conductors and physically as close to them as possible. Make the ground path continuous from the service entrance equipment, through the distribution system, to each outlet and electrically operated device in the Project.

I) Provide a grounding conductor in each of the following conduits and connect to the grounding system at each end:

1. In each run of non-metallic conduit.
2. In each feeder from a main switchgear to each substation, distribution switchboard, motor control center and other equipment shown.
3. In each run that includes a section of flexible or liquid tight conduit, unless conduit and fittings are UL approved for grounding.
4. In each branch circuit.

J) Provide ground rods where indicated. In spaces accessible to authorized personnel only, leave top 6" of rod exposed for visual inspection of connection. In other locations bury top of rod at least 6" below top of finished construction. At service entrance, install a sufficient number of rods to obtain required ground resistance. Interconnect all rods in each group with ground cable. Use cadweld connections for all underground and exterior work and interior work where indicated.

K) Maximum ground resistance at each cluster of ground rods shall not exceed 5 ohms when measured with a "Megger". Take readings when ground is dry, at least 48 hours after rain or 48 hours after all snow has melted. Record measurement and date of reading for each rod cluster, and

submit record to Architect for delivery to Owner.

L) Provide schedule 40 P.V.C. conduit stub-ups for terminating bare conductor ground wires.

M) Use approved grounding connectors. Clean surfaces bright before installing. Touch up painted surfaces after installation to prevent corrosion.

N) Use copper grounding conductors: aluminum will not be accepted. In general, use bare wire. Where insulated wire is required use green color code as hereinbefore specified.

O) At service equipment, interconnect the grounding conductor with the system neutral and theequipment grounding conductor. Bond all enclosures of service equipment. Where multiple knockouts are used, provide grounding bushings on conduit and interconnect with equipment grounding conductor. Connect neutral on supply side of service switch. Keep neutral insulated from ground on load side of service switch, except at transformers for separately derived systems.

P) At switchboards, and similar equipment, connect to ground bus inside the equipment enclosure. Ground metering, transformer neutral, transformer ground pad, grounding devices, and all non-current carrying metal part including frame of enclosure, conduit, grounding conductors and the like. Provide grounding bushings on metallic conduit and interconnect with ground wire to ground bus.

Q) Ground frames of motors. Provide grounding bushing on conduit and extend grounding conductor to a bolt on frame of motor. Where motor is part of apparatus, such as an air handling unit, ground enclosure using connector furnished by manufacturer. Provide connector if none is furnished.

R) Where cable wiring is used, interconnect ground wires of cables in each box with connector,and extend one ground wire to ground screw of box. Connect ground wire to ground bus at panelboards.

S) At convenience receptacles, extend ground wire from grounding screw of receptacle to grounding connector of box.

T) Provide other grounding methods as required.

U) All exterior wiring to be installed 6" below local frost line, minimum 30", unless otherwise noted. All underground copper wiring to be furnished with locator tape with magnetic wire buried6" below grade. All underground connections shall be exothermic (Cadweld). Other exterior connections shall be exothermic (Cadweld) unless otherwise noted or approved.

V) Connect ground system to building foundation reinforcing bar at corners of building with #2/0AWG bare stranded copper wire. Connections at reinforcing bars and ground rods to be exothermic(Cadweld). Ground rod connections to be accessible for testing and inspection.

3.02 FIELD QUALITY CONTROL

A) Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B) Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART I - GENERAL

1.01 WORK INCLUDED

A) Conduit and equipment supports.

B) Fastening hardware.

1.02 COORDINATION

A) Coordinate size, shape and location of concrete pads with the General Contractor.

1.03 QUALITY ASSURANCE

A) Support systems shall be adequate for weight of equipment and conduit, including wiring, whichthey carry.

PART II - PRODUCTS

2.01 MATERIAL

A) Support Channel: Galvanized or painted steel.

B) Hardware: Corrosion resistant.

PART III - EXECUTION

3.01 INSTALLATION

A) Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure usingexpansion anchors. Do not use spring steel clips and clamps.

B) Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitionsand walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws inwood construction.

C) Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D) Do not use power-actuated anchors.

E) Do not drill structural steel members.

F) Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat

appearance. Use hexagon head bolts with spring lock washers under allnuts.

G) In wet locations install free-standing electrical equipment on concrete pads.

H) Install surface-mounted cabinets and panelboards with minimum of four anchors.

I) Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards instud walls.

END OF SECTION 260529

SECTION 260533 - CONDUIT

PART I - GENERAL

1.01 WORK INCLUDED WHERE SPECIFIED ON THE DRAWINGS.

A) Rigid metal conduit and fittings.

B) Electrical metallic tubing and fittings.

C) Flexible metal conduit and fittings.

D) Liquidtight flexible metal conduit and fittings.

E) Intermediate metal conduit and fittings.

PART II - PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

A) Rigid Steel Conduit: ANSI C80.1

B) Fittings and Conduit Bodies: ANSI/NEMA FB 1;
threadedtype, material to match conduit.

2.02 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A) EMT: ANSI C80.3 galvanized tubing.

B) Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

2.03 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A) IMC: ANSI C80.6 zinc coated.

B) Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

2.04 RIGID PVC CONDUIT AND FITTINGS

A) Schedule 40 and 80 rigid PVC Conduit ANSI/UL 651

2.05 FLEXIBLE METAL CONDUIT AND FITTINGS

A) Conduit: ANSI/UL 1

B) Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.06 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A) Conduit: ANSI/UL 360 Liquid-Tight Flexible Steel Conduit

B) Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.07 CONDUIT SUPPORTS

A) Conduit Clamps, Straps, and Supports: Steel or malleable iron.

PART III - EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A) Size conduit for conductor type installed or for Type THWN OR EQ conductors, whichever islarger; ½" inch minimum size.

B) Arrange conduit to maintain headroom and present a neat appearance.

C) Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to wallsand adjacent piping.

D) Maintain minimum 6 inch (150 mm) clearance between conduit and piping. Maintain 12 inch(300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E) Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stampedgalvanized hangers.

F) Group conduit in parallel runs where practical and use conduit rack constructed of steel channelwith conduit straps or clamps. Provide space for 25 percent additional conduit.

G) Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporaryconduit support during construction, before conductors are pulled.

H) Support conduit at a maximum of 10 feet on center and within 3 feet of any device (i.e. junctionbox, etc.).

3.02 CONDUIT INSTALLATION

A) Cut conduit square using a saw or pipecutter; de-burr cut ends.

B) Bring conduit to the shoulder of fittings and couplings and fasten securely.

C) Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduitto sheet metal boxes in damp or wet locations.

D) Install no more than the equivalent of three 90degree bends between boxes.

E) Use conduit bodies to make sharp changes in direction, such as, around beams.

F) Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch(50 mm) size.

G) Avoid moisture traps where possible; where unavoidable, provide junction box with drain fittingat conduit low point.

H) Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I) Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleevesand nipples.

J) Install expansion joints where conduit crosses building expansion joints.

K) Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL listed,fire-barrier rated, foamed silicone elastomer compound to maintain wall rating.

L) Route conduit through roof openings for piping and ductwork where possible; otherwise, routethrough roof jack with pitch pocket.

3.03 CONDUIT INSTALLATION SCHEDULE

A) Installations In or Under Concrete Slab, or Underground Within Five Feet of Foundation Wall:Rigid steel conduit.

B) In Slab Above Grade: Rigid steel conduit.

C) Exposed Outdoor Locations: Rigid steel conduit.

D) Concealed Dry Interior Locations: Electrical metallic tubing or Intermediate Metal Conduit.

E) Exposed Dry Interior Locations: Electrical metallic tubing or Intermediate Metal Conduit.

F) General Underground: PVC listed for direct burial installation.

END OF SECTION 260533

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SECTION 260534 - RACEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wireways.

B. Wall duct.

1.02 RELATED SECTIONS

A. Section 16113-1 - Underfloor Ducts: Trench duct.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. National Electrical Contractor's Association (NECA) Standard of Installation.

C. NEMA WD 6 - Wiring Device Configurations.

D. Underwriters Laboratories (UL) Standard of Safety 870 - Wireways, Auxiliary Gutters andAssociated Fittings

E. National Electrical Code (NEC) 362 - Wireways, 374 - Auxiliary Gutters

1.04 SUBMITTALS

A. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under article 1.03 - References. Include instructionsfor storage, handling, protection, examination, preparation, and installation of Product.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Sectionwith minimum five years of [documented] experience.

B. Furnish Products listed and classified by UL, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS:WIREWAY

A. Manufacturers:

1. Square D Company: LD SQUARE-Duct NEMA 1 (or approved equal)

B. Description: General purpose type wireway.

C. Knockouts: Manufacturer's standard.

D. Size: As required.

E. Cover: Screw cover.

F. Connector: Slip-in.

G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.

H. Finish: Electro-coated ANSI-49 Gray Epoxy Paint over Phosphate Primer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumband level.

C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

D. Wireway Supports: Per manufacturers recommendations.

E. Close ends of wireway and unused conduit openings.

END OF SECTION 260534

SECTION 260535 - WIRE AND CABLE

PART I - GENERAL

1.01 WORK INCLUDED

A) Building wire.

B) Cable.

C) Wiring connections and terminations.

PART II - PRODUCTS

2.01 BUILDING WIRE

A) Thermoplastic-insulated Building Wire: ANSI/UL 83, ANSI/UL 493, and ANSI/ICEA S-5-434

B) Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 voltinsulation, THW/THHN/THWN.

C) Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THW/THHN/THWN/, 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.

D) Control Circuits: Copper, stranded conductor
600 voltinsulation, THW/THHN/THWN as approved.

E) Service Entrance Cable: Copper conductor, 600 volt insulation, RHW/THWN/THHW.

2.02 METAL-CLAD CABLE

A) Metal-Clad Cable, Size 12 through 1 AWG: Copper conductor, 600 volt insulation, rated 90degree C, galvanized steel armor, Type MC.

2.03 REMOTE CONTROL AND SIGNAL CABLE

A) Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 voltinsulation, rated 60 degree C, individual conductors twisted together, and covered with a PVC jacket.

B) Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor,300 volt insulation, rated 60 degree C, individual conductors twisted together and covered with aPVC jacket; UL listed.

C) Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor,

300 volt insulation, rated 60 degree C, individual conductors twisted together and covered with anonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

PART III - EXECUTION

3.01 GENERAL WIRING METHODS

A) Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14AWG for control wiring.

B) Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75feet (unless otherwise noted).

C) Place an equal number of conductors for each phase of a circuit in same raceway or cable.

D) Splice only in junction or outlet boxes.

E) Neatly train and lace wiring inside boxes, equipment, and panelboards.

F) Make conductor lengths for parallel circuits equal.

3.02 WIRING INSTALLATION IN RACEWAYS

A) Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricantfor pulling 4 AWG and larger wires.

B) Install wire in raceway after interior of building has been physically protected from theweather and all mechanical work likely to damage conductors has been completed.

C) Completely and thoroughly swab raceway system before installing conductors.

3.03 CABLE INSTALLATION

A) Provide protection for exposed cables where subject to damage.

B) Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clipsor plastic cable ties to support cables from structure or ceiling suspension system. Include bridle rings or drive rings.

C) Use suitable cable fittings and connectors.

3.04 WIRING CONNECTIONS AND TERMINATIONS

A) Splice only in accessible junction boxes.

B) Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

C) Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tapeuninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

D) Thoroughly clean wires before installing lugs and connectors.

E) Make splices, taps and terminations to carry full ampacity of conductors without perceptibletemperature rise.

F) Terminate spare conductors with electrical tape and/or wirenuts.

3.05 FIELD QUALITY CONTROL

A) Field inspection and testing will be performed under provisions of Section 16100.

B) Inspect wire and cable for physical damage and proper connection.

C) Torque test conductor connections and terminations to manufacturer's recommended values.

D) Perform continuity test on all power and equipment branch circuit conductors. Verifyproper phasing connections.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

A) Concealed Interior Locations: Building wire in raceways.
B) Exposed Interior Locations: Building wire in raceways.
C) Above Accessible Ceilings: Building wire in raceways.

D) Wet or Damp Interior Locations: Building wire in raceway.

E) Exterior Locations: Building wire in raceways.

F) Underground Locations: Building wire in raceways.

END OF SECTION 260535

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SECTION 260536 - BOXES

PART I - GENERAL

1.01 WORK INCLUDED

A) Wall and ceiling outlet boxes.

B) Floor boxes.

C) Pull and junction boxes.

1.02 RELATED WORK

A) Section 262726 - Wiring Devices

PART II - PRODUCTS

2.01 OUTLET BOXES

A) Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with 1/2 inch (13 mm)male fixture studs where required.

B) Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C) Cast Boxes: Cast feralloy, deep type, gasketed cover, threaded hubs.

2.02 FLOOR BOXES

A) Floor Boxes for Installation in Cast-In-Place Concrete Floors: cast iron.

2.03 PULL AND JUNCTION BOXES

A) Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B) Sheet Metal Boxes Larger Than 12 Inches (300 mm) in Any Dimension: Hinged enclosure.

C) Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 andType 6, flat-flanged, surface-mounted junction box, UL listed as raintight.
Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steelcover screws.

D) Cast Metal Boxes for Underground Installations: NEMA 250; Type 4 and Type 6, outside flanged, recessed cover box for flush mounting, UL listed as raintight.
Galvanized cast iron boxand plain cover with neoprene gasket and stainless steel cover screws.

E) Fiberglass Handholes for Underground Installations: Die-molded with pre-cut 6 x 6 inch (150 x 150 mm) cable entrance at center bottom of each side; fiberglass weatherproof cover withnon-skid finish.

PART III - EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

A) Provide electrical boxes as shown on Drawings, and as required for splices, taps, wirepulling, equipment connections, and code compliance.

B) Electrical box locations shown on Drawings are approximate unless dimensioned. Verifylocation of floor boxes and outlets in offices and work areas prior to rough-in.

C) Locate and install boxes to allow access. Where installation is inaccessible, coordinatelocations and sizes of required access doors.

D) Locate and install to maintain headroom and to present a neat appearance.

3.02 OUTLET BOX INSTALLATION

A) Do not install boxes back-to-back in walls. Provide minimum 6 inch (150 mm) separation,except provide minimum 24 inch (600 mm) separation in acoustic-rated walls and fire-rated walls.

B) Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinatemasonry cutting to achieve neat openings for boxes.

C) Provide knockout closures for unused openings.

D) Support boxes independently of conduit.

E) Use multiple-gang boxes where more than one device are mounted together; do not usesectional boxes. Provide barriers to separate wiring of different voltage systems.

F) Install boxes in walls without damaging wall insulation.

G) Coordinate mounting heights and locations of outlets mounted above counters, benches, andbacksplashes.

H) Position outlets to locate luminaries as shown on reflected ceiling plans.

I) In inaccessible ceiling areas, position outlets and junction boxes within 6 inches (150 mm) ofrecessed luminaire, to be accessible through luminaire ceiling opening.

J) Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition

studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flushceiling outlet boxes.

K) Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

L) Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.

3.03 FLOOR BOX INSTALLATION

A) Set boxes level and flush with finish flooring material.

B) Use cast iron floor boxes for installations in slab on grade.

3.04 PULL AND JUNCTION BOX INSTALLATION

A) Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B) Support pull and junction boxes independent of conduit.

END OF SECTION 260536

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART I - GENERAL

1.01 WORK INCLUDED

A) Nameplates and tape labels.

B) Wire and cable markers.

C) Conduit color coding.

1.02 SUBMITTALS

A) Submit shop drawings under provisions of Section 260000.

B) Include schedule for nameplates and tape labels.

PART II - PRODUCTS

2.01 MATERIALS

A) Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B) Tape Labels: Embossed adhesive tape, with 3/16 inch white letters on black background will bepermitted for junction boxes and concealed components.

C) Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART III - EXECUTION

3.01 INSTALLATION

A) Degrease and clean surfaces to receive nameplates and tape labels.

B) Install nameplates and tape labels parallel to equipment lines.

C) Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate toinside face of recessed panelboard doors in finished locations.

3.02 WIRE IDENTIFICATION

A) Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junctionboxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings forcontrol wiring.

3.03 NAMEPLATE ENGRAVING SCHEDULE

A) Provide nameplates of minimum letter height as scheduled below.

B) Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation.1/8 inch; identify voltage rating and source.

C) Individual Circuit Breakers, Switches, and Motor Starters In Panelboards, Switchboards, andMotor Control Centers: 1/8 inch; identify circuit and load served, including location.

D) Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify loadserved.

E) Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondaryvoltages, primary source, and secondary load and location.

3.04 CONDUIT COLOR CODING SCHEDULE

A) Use colored tape to identifying conduit by system.

1) Primary Distribution System: green
2) 208/120 Volt, three phase system: blue
3) Fire Alarm System: red
4) Motor and Other Control Systems: yellow
5) Telephone System: white

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A) Power Distribution Panelboard - Furnish and install distribution panelboard(s) asspecified herein and where shown on the associated drawings.

B) Lighting and Appliance Panelboard - Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated drawings.

1.02 REFERENCES

The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.

A) NEMA PB 1 - Panelboards

B) NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance ofPanelboards Rated 600 Volts or Less.

C) NEMA AB 1 - Molded Case Circuit Breakers

D) NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600Volts Maximum)

E) UL 50 - Enclosures for Electrical Equipment

F) UL 67 - Panelboards

G) UL 98 - Enclosed and Dead-front Switches

H) UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures I)CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed PanelboardsJ)CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers

K) Federal Specification W-P-115C - Type I Class 1

L) Federal Specification W-P-115C - Type II Class 1

M) Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit And Service.

N) Federal Specification W-C-865C - Fusible Switches

O) NFPA 70 - National Electrical Code (NEC)

P) ASTM - American Society of Testing Materials

1.03 SUBMITTAL AND RECORD DOCUMENTATION

A) Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearlyshown. In addition, the drawing shall illustrate one line diagrams with applicablevoltage systems.

1.04 QUALIFICATIONS

A) Panelboards shall be manufactured in accordance with standards listed Article 1.02 -REFERENCES.

1.05 DELIVERY, STORAGE, AND HANDLING

A) Inspect and report concealed damage to carrier within their required time period.

B) Handle carefully to avoid damage to panelboard internal components, enclosure, andfinish.

C) Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s)from dirt, water, construction debris, and traffic.

1.06 OPERATIONS AND MAINTENANCE MATERIALS

A) Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Shall be Square D, Siemens, or General Electric panelboards (or approved equal):

B) Substitutions must be submitted in writing three weeks prior to original bid date with supporting documentation demonstrating that the alternate manufacturer meets allaspects of the specification herein.

2.02 POWER DISTRIBUTION PANELBOARD

A. 208/120VAC DISTRIBUTION PANELBOARDS

1) Interior

a) Shall be rated for 240 VAC maximum. Continuous main current ratings, as indicated on associated schedules, not to exceed 600 amperes maximum.

b) Minimum short circuit current rating: as indicated in rms symmetrical amperes at240 VAC.

c) Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shallbe determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-600 amperes shall be copper.

d) All current-carrying parts shall be insulated from ground and phase-to-phase byhigh dielectric strength thermoplastic or equivalent.

e) Solid neutral shall be plated and located in the mains compartment so allincoming neutral cable may be of the same length.

f) Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.

g) Nameplates shall contain system information and catalog number or factory ordernumber. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.

h) Interiors shall be field convertible for top or bottom incoming feed. Main and sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

2. Branch Circuit Breakers

a) Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings,and number of poles as indicated on the panelboard schedules.

b) Molded case branch circuit breakers installed in 400 ampere panels shall havebolt-on type bus connectors.

c) Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal andmagnetic trip elements in each pole. Two-pole and three-pole circuit breakers shall have common tripping of all poles.

d) There shall be two forms of visible trip indication. The breaker handle shallreside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.

e) The exposed faceplates of all branch circuit breakers shall be flush with oneanother.

f) Lugs shall be UL Listed to accept solid or stranded copper conductors only.Lugs shall be suitable for 75□ C rated wire.

3. Enclosures

a. Type 1 Boxes

1) Boxes shall be galvanized steel constructed in accordance with UL 50requirements. Galvanealed steel will not be acceptable.

2) Boxes shall have removable endwalls with knockouts located on one end. Boxesshall have welded interior mounting studs. Interior mounting brackets are not required.

3) Box width shall be 20 in wide.

b. Type 1 Fronts

1) Front shall meet strength and rigidity requirements per UL 50 standards. Frontshall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) Fronts shall be hinged 1-piece with door. Mounting shall be as indicated onassociated drawings.

3) Panelboards rated 225 amperes and below shall have flat fronts with concealed door hinges and trim screws. Front shall not be removable with the door locked.Panelboards rated above 225 amperes shall have fronts with trim clamps and concealed door hinges. Front doors shall have rounded corners and edges shall be free of burrs.

4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. Two (2) keysshall be provided with each lock. A clear plastic directory card holder shall be

mounted on the inside of door.

B. 208/120VAC MAIN PANELBOARD

1. Interior

a. Shall be rated 240 VAC maximum. Continuous main current ratings as indicatedon associated drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

b. Provide UL Listed short circuit current ratings (SCCR) as indicated on the associated drawings not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 rms symmetrical amperes.Main breaker panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.

c. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to theentire length of bus.

d. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing rated 100 through 600 amperes shall be plated copper. Bussing rated 800 amperes and above shall be plated copper. The entire interleaved assembly shall be contained between two (2) U-shaped steel channels,permanently secured to a galvanized steel mounting pan by fasteners employing the use of a tamper-resistant warning label.

e. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

f. Equipment ground bar shall be bonded. Ground bar shall be copper. Solid neutral shall be equipped with a full capacity grounding strap for service entranceapplications. Gutter-mounted neutral will not be acceptable.

g. Nameplates shall contain system information and catalog number or factory ordernumber. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be provided. Leveling provisions shall be provided for flush mounted applications.

2. Molded Case Circuit Breakers - Mains and Branches

a. Common Characteristics

1) Circuit breakers shall be constructed in accordance with the following standards: UL 489 Federal Specification W-C-375B/GEN NEMA AB1 CSA 22.2, No. 5-M91 IEC 157-1 BS 4752

2) Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength. Current-carrying components shall be completely isolated from the handle and the accessory mounting area.

3) Circuit breakers shall have an overcenter, trip-free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

4) Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

5) Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

6) Breaker faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIR ratings.

7) Circuit breakers shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.

8) Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings. Circuit breakers shall be suitable for mounting and operating in any position.

9) Circuit breakers equipped with line terminal jaws shall meet the following requirements. In the event of a short circuit condition, the increased magnetic flux shall cause the jaws to grip the supply bus more firmly. Circuit breaker jaws shall be protected by an impact resistant molded shroud.

10) Circuit breakers equipped with line terminal jaws shall not require any additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Each individual circuit breaker shall be capable of being mounted independently. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.

11) Manufacturer shall provide time/current characteristic trip curves (Ip and

I^2T let-through curves for true current limiting circuit breakers only) for each type of

circuit breaker.

12) Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 75□ C rated wire. Lug body shall be bolted in place;snap-in designs are not acceptable.

(a) Circuit breakers shall be UL Listed for use with the following accessories: ShuntTrip, Under Voltage Trip, Auxiliary Switch, Alarm Switch, Ground Fault Shunt Trip, Electrical Operators, Cylinder Locks, Mechanical Lugs Kits, Compression Lugs Kits, and Handle Accessories.

b. [Thermal Magnetic]

1) Circuit protective devices shall be molded case circuit breakers. Circuit breakersshall be standard interrupting construction. Ampere ratings shall be as shown onthe drawings.

2) Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Thermal elements shall be factory calibrated to operate in a 40□ C ambient environment. Thermal elements shall be ambient compensatingabove 40□ C.

3) Two- and three-pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping. Circuit breaker frame sizes above 100 amperesshall have a single magnetic trip adjustment located on the front of the breaker which allows the user to simultaneously select the desired trip level of all poles.

4) Standard circuit breakers up to 250 amperes at 600 VAC shall be UL Listed withHACR ratings.

3. Enclosures

a. Type 1 Boxes

1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvannealed steel will not be acceptable.

2) Boxes shall have removable blank endwalls and interior mounting studs. Interiorsupport bracket shall be provided for ease of interior installation.

3) Maximum enclosure dimensions shall be 42 in wide and 9.5 in deep.

b. Type 1 Trim Fronts

1) Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel

electrodeposited over

cleaned phosphatized steel.

2) Trim front shall be [4-piece surface] [1-piece with door] [hinged 1-piece with door] available in [flush] [surface] mount. Trim front door shall have roundedcorners and edges free of burrs. A clear plastic directory card holder shall be mounted on the inside of the door.

3) Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. Two
(2) keys shall be provided with each lock.

PART 3 EXECUTION

3.01 INSTALLATION

A) Install panelboards in accordance with manufacturer's written instructions, NEMAPB 1.1 and NEC standards.

B) Anchor panelboards to structure and make branch circuit connections.

C) Coordinate the panelboard bus ratings and circuit breaker coordination rating withthe available fault current.

3.02 FIELD QUALITY CONTROL

A) Inspect complete installation for physical damage, proper alignment, anchorage,and grounding.

B) Measure steady state load currents at each panelboard feeder; rearrange circuits inthe panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

C) Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION 262416

SECTION 262713 - SERVICE ENTRANCE

PART I - GENERAL

1.01 WORK INCLUDED

A) Arrangement with Utility Company for permanent electric service including payment of UtilityCompany charges for service.

B) Underground service entrance.

1.02 SYSTEM DESCRIPTION

A) System Voltage: Per design drawings.

B) Service Entrance: Per design drawings.

1.03 QUALITY ASSURANCE

A) Utility Company: Local Electric Power Distributor

B) Install service entrance in accordance with Utility Company's rules and regulations.

1.04 SUBMITTALS

A) Submit shop drawings and product data under provisions of Section 16100.

B) Submit Utility Company prepared drawings.

PART II - PRODUCTS

2.01 METERING EQUIPMENT

A) Meter: Furnished by Local Electric Power Distributor

B) Meter Base: Per Electric Power Distributor's Requirements

C)Metering Transformer: Per Electric Power Distributor's Requirements.PART III - EXECUTION

3.01 INSTALLATION

A) Make arrangements with Utility Company to obtain permanent electric service to the Project.

B) Underground: Install service entrance conduits in concrete envelope from Utility Company's

pole-mounted transformer location to building service entrance equipment. Utility Company willconnect service lateral conductors to service entrance conductors.

C) Install grounding components in accordance with utility company requirements.

END OF SECTION 262713

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SECTION 262726 - WIRING DEVICES

PART I - GENERAL

1.01 WORK INCLUDED

A) Wall switches.

B) Wall dimmers.

C) Receptacles.

D) Floor mounted service fittings.

E) Device plates and box covers.

1.02 SUBMITTALS

A) Submit product data under provisions of Section 260000.

B) Provide product data showing configurations, finishes, dimensions, and manufacturer'sinstructions.

PART II - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES.

A) HUBBELL

B) PASS & SEYMOUR

C) LEVITON

D) Substitutions: Under provisions of Section 260000.

2.02 WALL SWITCHES

A) Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: NEMA WD; 1. AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC.

2.03 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A) HUBBELL

B) PASS & SEYMOUR

C) LEVITON

D) Substitutions: Under provisions of Section 260000.

2.04 RECEPTACLES

A) Convenience and Straight-blade Receptacles: NEMA 5-15R, NEMA 5-20R or as approved.

B) Locking-Blade Receptacles: NEMA L5-15R or as approved.

C) Convenience Receptacle Configuration: NEMA 5-15R, NEMA 5-20R or as approved, plasticface.

D) Specific-use Receptacle Configuration: NEMA 5-15R or NEMA 5-20R; type as indicated onDrawings, plastic face.

E) GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter.

F) 208VAC Single-Phase Receptacle: 30 Ampere minimum rated (or as defined on designdrawings), configured to match equipment plugs.

2.05 ACCEPTABLE MANUFACTURERS - FLOOR MOUNTED SERVICE FITTINGS

A) HUBBELL

B) THOMAS & BETTS

C) STEEL CITY

D) Substitutions: Under provisions of Section 16100.

2.06 FLOOR MOUNTED SERVICE FITTINGS

A) Flush Covers for Duplex Convenience Receptacle: Ivory thermoplastic flush cover suitable forfloor box with carpet insert. Hubbell Catalog No. 3SFBC (or equal).

2.07 ACCEPTABLE MANUFACTURERS - WALL DIMMERS

A) HUBBELL

B) PASS & SEYMOUR

C) LITHONIA

D) Substitutions: Under provisions of Section 260000.

2.08 WALL DIMMERS

A) Wall Dimmers: linear slide type.

B) Rating: 2000 Watts minimum.

2.09 ACCEPTABLE MANUFACTURERS - WALL PLATES

A) HUBBELL

B) PASS & SEYMOUR

C) LEVITON

D) Substitutions: Under provisions of Section 260000.

2.10 WALL PLATES

A) Decorative Cover Plate: smooth plastic.

B) Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers.

PART III - EXECUTION

3.01 INSTALLATION

A) Install wall switches 48 inches above floor, OFF position down.

B) Install wall dimmers 48 inches above floor; derate ganged dimmers as instructed by manufacturer; do not use common neutral.

C) Install convenience receptacles 16 inches above floor, 6 inches above backsplash, grounding poleon bottom.

D) Install specific-use receptacles at heights shown on Contract Drawings.

E) Drill opening for poke-through fitting installation accordance with manufacturer's instructions.

F) Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbosize plates for outlets installed in masonry walls.

G) Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, aboveaccessible ceilings, and on surface-mounted outlets.

I) Install devices and wall plates flush and level.

END OF SECTION 262726

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SECTION 262816 - DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A) Switches shall be furnished and installed at locations as shown on the drawings.Switches shall be of the type approved, indicated and specified herein.

1.02 REFERENCES

Switches shall be manufactured in accordance with the following standards:

A) UL 98 - Enclosed and Dead Front Switches
B) NEMA KS 1 - Enclosed Switches
C) NEMA 250 - Enclosures for Electrical Equipment

1.03 DRAWINGS

A) In accordance with 260000, provide outline drawings with dimensions, andequipment ratings for voltage, amperage, horsepower and short circuit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A) Switches shall be manufactured by Square D, Siemens, or approved equal.

2.02 SWITCH INTERIOR

B) All switches shall have switch blades which are visible when the switch is OFFand the cover is open.

C) Lugs shall be UL Listed for 75º C copper conductors.

C)All current carrying parts shall be plated to resist corrosion.

2.03 SWITCH MECHANISM

A) The switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not becapable of being restrained by the operating handle after the closing or openingaction of the contacts has started.

B) The operating handle shall be an integral part of the box, not the cover.

C) Provisions shall be provided for padlocking the switch in the OFF position.

2.04 SWITCH ENCLOSURES

A) The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1) or gray bakedenamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

B) Tangential knockouts shall be provided to facilitate ease of conduit entry onswitches through 200 ampere.

C) Enclosures for Type 3R switches through 200 ampere shall have provisions forinterchangeable bolt-on hubs in the top endwall.

2.05 SWITCH RATINGS

A) Switches shall be horsepower rated for use with the equipment as indicated on theplans.

B) The UL Listed short circuit rating shall be 100,000 rms symmetrical ampereswhen used with or protected by Class R fuses (30-600 ampere switches employing appropriate fuse rejection scheme).

PART 3 EXECUTION

3.01 INSTALLATION

A) Install disconnect switches where indicated on Drawings.

B) Install fuses in fusible disconnect switches as indicated on drawings.

END OF SECTION 262816

SECTION 262817 - OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermal Magnetic Molded Case Circuit Breakers - Furnish as specified hereinand where shown on the associated drawing.

1.02 REFERENCES

The circuit breaker(s) referenced herein shall be designed and manufactured according tothe latest revision of the following standards.

A. NEMA AB 1- (National Electrical Manufacturers Association) Molded CaseCircuit Breakers and Molded Case Switches

B. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers andCircuit Breaker Enclosures

C. UL 943 - Standard for Ground Fault Circuit Interrupters

D. CSA C22.2 No. 5.1 - M91 - (Canadian Standard Association) Molded CaseCircuit Breakers

E. Federal Specification W-C-375B/GEN - Circuit Breakers, Molded Case; BranchCircuit and Service

F. National Fire Protection Association NFPA - 70 (National Electrical Code)

1.03 SUBMITTALS

A. In accordance with 260000, provide outline drawings with dimensions, and ratings for voltage, amperage and maximum interruption. Include instructions for identification and receiving inspection, circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

1.04 QUALIFICATIONS

A. The molded case circuit breaker manufacturer shall furnish products listed byUnderwriters Laboratories Incorporated (UL).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Case Circuit Breakers shall be Square D, Siemens, General Electric, orapproved equal.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. Molded Case Circuit Breaker Characteristics - General

1. Circuit breakers shall be of molded case construction. Current carrying components shall be completely isolated from the handle and the accessorymounting area.

2. Circuit breakers shall have an over center, trip free, toggle operating mechanismwhich will provide quick-make, quick-break contact action. The circuit breakershall have common tripping of all poles.

3. The circuit breaker handle shall reside in a tripped position between ON and OFFto provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF.

4. The maximum ampere rating and UL, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearlymarked on face of circuit breaker.

5. Manufacturer shall provide electronic and hard copy time/current characteristictrip curves (and Ip & I²t let through curves for current limiting circuit breakers)for each type of circuit breaker.

6. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

7. Circuit breakers shall be fixed construction with factory installed mechanical lugs.Lug body shall be bolted in place; snap in design is not acceptable. All lugs shallbe UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper conductors only. Lugs shall be suitable for 75□ C rated wire.

B. Thermal-Magnetic Circuit Breakers

1. Circuit breakers shall have a permanent trip unit containing individual thermaland magnetic trip elements in each pole.

2. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a40□ C ambient temperature.

3. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip

adjustment located on the front of the circuit breaker.

4. Standard two-pole and three-pole circuit breakers up to 250 amperes at 600 VACshall be UL Listed as HACR type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install circuit breakers in accordance with manufacturers instructions, the National Electrical Code and applicable local codes.

END OF SECTION 262817

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.2 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. EMT: Electrical metallic tubing.

C. TGB: Telecommunications grounding busbar.

D. TMGB: Telecommunications main grounding busbar.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For **Installer,** installation supervisor, and field inspector.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS **Technician** who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as **ITS Installer 2** to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

A. Comply with J-STD-607-A.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: **No. 6** AWG.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-holecopper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Busbar Connectors: Cast silicon bronze, solderless **compression**-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two- bolt connection to the busbar.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, **1/4 by 4 inches** in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a **4-inch** clearance to access the rearof the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, **1/4 by 2 inches** in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed ascomplying with UL 467, and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch ((50-mm) clearanceto access the rear of the busbar. Brackets and bolts shall be stainless steel.)
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardwarefor attachment to the cabinet.

2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches ((1827 or 914 mm) long, with) stainless- steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: **Copper-clad**; **3/4 inch by 10 feet** in diameter.

2.6 LABELING

A. Comply with TIA 606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance ofthe Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with J-STD-607-A.

3.3 APPLICATION

A. Conductors: Install solid conductor for **No. 8** AWG and smaller and stranded conductors for **No. 6** AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildingsshall not be smaller than **No. 6** AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildingsshall not be smaller than **No. 6** AWG.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwiseindicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches ((900mm).)

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduitenters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than **No. 3/0** AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than **No. 6** AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backboneconductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG **168 kcmils (85 sq. mm)** unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install **top-mounted** rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA 568 when grounding screened, balanced, twisted-pair cables.

J. Rack and Cabinet Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding

conductor in the power cord of cord- and plug-connected equipment shall be considered as asupplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

3.7 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

   a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus
   2.0 percent.

   a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds **5** ohms, notifyArchitect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 270526

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS

SYSTEMSPART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Surface pathways.
5. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked forintended location and application.
2. Comply with TIA-569.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: **Steel**.
b. Type: **Setscrew or compression**.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, ratedfor environmental conditions where installed, and including flexible external bonding jumper.

F. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Continuous HDPE: Comply with UL 651B.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway, approved for **plenum, riser or general-use** installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569.

2.4 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569.

B. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, **aluminum**, Type FD, withgasketed cover.

D. Box extensions used to accommodate new building finishes shall be of same material asrecessed box.

E. Metal Floor Boxes:

1. Material: **Cast metal or sheet metal**.
2. Type: **Fully adjustable**.
3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, **castaluminum** with gasketed cover.

H. Device Box Dimensions: **4 inches square by 2-1/8 inches deep (100 mm square by 60 mmdeep)**.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, **Type 1** OR **Type 3R** withcontinuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, **Type 1** or **Type 3R** galvanized-steel box with removable interior panel andremovable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualifiedtesting agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: **GRC**.
2. Concealed Conduit, Aboveground: **GRC**, **EMT**, **RNC, Type EPC-40-PVC**.
3. Boxes and Enclosures, Aboveground: NEMA 250, **Type 3R**.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: **EMT**.
2. Exposed, Not Subject to Severe Physical Damage: **EMT**
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: **EMT**
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: **Plenum-type, optical-fiber-cable pathway**, **Plenum-type, communications-cable pathway, or EMT.**
7. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: **EMT**.
8. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 **stainless steel** in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch (21-mm) trade size. Minimum size for optical-fiber cables is1 inch (27 mm).

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use **setscrew or compression**, **steel** or **cast-metal** fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds **120 deg F (49 deg C)**.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Arrange stub-ups so curved portions of bends are not visible above finished slab.

D. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated.Install conduits parallel or perpendicular to building lines.

F. Stub-ups to Above Recessed Ceilings:

1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs orin an enclosure.

G. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxesor cabinets. Install insulated bushings on conduits terminated with locknuts.

I. Install pathways square to the enclosure and terminate at enclosures with locknuts. Installlocknuts hand tight plus 1/4 turn more.

J. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

K. Spare Pathways: Install pull wires in empty pathways. Cap underground pathways designated asspare above grade alongside pathways in use.

L. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicatedon Drawings.

M. Pathways for Optical-Fiber and Communications Cable: Install pathways as follows:

1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50feet (15 m).
2. 1-Inch (27-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet(23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathwayunless Drawings show stricter requirements.

N. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them withlisted sealing compound.

O. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigeratedspaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

4. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C)of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
5. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
6. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

P. Mount boxes at heights indicated on Drawings in accordance with ADA requirements. Installboxes with height measured to **center** of box unless otherwise indicated.

Q. Horizontally separate boxes mounted on opposite sides of walls so they are not in the samevertical channel.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

END OF SECTION 270528

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications equipment racks and cabinets.
4. Grounding.

B. Related Requirements:
1. Section 271500 "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations,sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and fieldinspector.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of Commercial Installer, Level 2.

2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).

2.2 EQUIPMENT FRAMES

A. General Frame Requirements:

1. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310-D standard, 19-inch (480-mm) panel mounting.
3. Finish: Manufacturer's standard, baked-polyester powder coat.

B. Floor-Mounted Racks: Modular-type, steel or aluminum construction.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug.
2. Baked-polyester powder coat finish.

C. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.3 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked forintended location and application.
2. Rack mounting.
3. Six, 15-A, 120-V ac, NEMA WD 6, Configuration 5-15R receptacles.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.

6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot bereset.
7. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
8. Close-coupled, direct plug-in line cord.
9. Rocker-type on-off switch, illuminated when in on position.
10. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
11. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449clamping voltage for all three modes shall be not more than 330 V.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for CommunicationsSystems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wireterminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide (6 mm thick by 100mm wide) with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan orPVC, impulse tested at 5000 V.

C. Comply with J-STD-607-A.

2.5 LABELING

A. Comply with TIA 606 and UL 969 for a system of labeling materials, including label stocks,laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point,protected entrance terminals, and a housing when so directed by service provider.

B. Comply with requirements in Section 270528 "Pathways for Communications Systems" formaterials and installation requirements for underground pathways.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details ofequipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects,and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3. 3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3. 4 FIRESTOPPING

A. Comply with TIA-569, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3. 5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection"Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms andspaces.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA 606. Comply with requirements in Division 26.

B. Comply with requirements in Division 09 for painting backboards. For fire-resistant plywood,do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA 606 for Class 2 levelof administration.

D. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1. SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.

1. DEFINITIONS

A. Signal Ground: The ground reference point designated by manufacturer of the system that isconsidered to have zero voltage.

1. ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

C. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-holecopper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Busbar Connectors: Cast silicon bronze, solderless **compression**-type mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two- bolt connection to the busbar.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING BUSBARS

A. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches (1827 or 914 mm long, with) stainless- steel or copper-plated hardware for attachment to the rack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
2. Bond shields and drain conductors to ground at only one point in each circuit.

B. Signal Ground:

1. For each system, establish the signal ground and label that location as such.

2. Bond the signal ground to the alternating-current (ac) power system service by connecting to one of the following listed locations, using insulated **No. 6 AWG,** stranded,Type THHN wire:

   a. Grounding bar in an electrical power panelboard if located in the same room orspace as the signal ground.
   b. Telecommunications grounding busbar.

C. Comply with NECA 1.

3.2 APPLICATION

A. Conductors: Install solid conductor for **No. 8** AWG and smaller and stranded conductors for **No. 6** AWG and larger unless otherwise indicated.

B. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.

3.3 CONNECTIONS

A. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

B. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pre-twist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

C. Shielded Cable: Bond the shield of shielded cable to the signal ground. Comply with TIA 568 when grounding screened, balanced, twisted-pair cables.

D. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 280526

SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND

SECURITYPART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetallic conduits, tubing, and fittings.
3. Surface pathways.
4. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 270528 "Pathways for Communications Systems" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving communications systems.

1.2 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked forintended location and application.
2. Comply with TIA-569.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; **zinc-coated steel or aluminum**.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

    a. Material: **Steel**.
    b. Type: **Setscrew or compression**.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.

G. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569.

B. ENT: Comply with NEMA TC 13 and UL 1653.

C. RNC: **Type EPC-40-PVC**, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Continuous HDPE: Comply with UL 651B.

E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish.

C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's

standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wetlocations.

B. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, **aluminum**, Type FD, withgasketed cover.

D. Box extensions used to accommodate new building finishes shall be of same material asrecessed box.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, **castaluminum** with gasketed cover.

G. Device Box Dimensions: **4 inches square by 2-1/8 inches deep (100 mm square by 60 mmdeep).**

H. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, **Type 1**, **Type 3R**, or **Type 12** with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic or fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:

1. NEMA 250, **Type 1**, **Type 3R**, or **Type 12** galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualifiedtesting agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: **GRC**.
2. Concealed Conduit, Aboveground: **GRC**.
3. Boxes and Enclosures, Aboveground: NEMA 250, **Type 3R.**

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: **EMT**.
2. Exposed, Not Subject to Severe Physical Damage: **EMT**.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: **EMT**.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic,Electric-Solenoid, or Motor-Driven Equipment): FMC.
6. Damp or Wet Locations: GRC.
7. Pathways for Optical-Fiber or Communications Cable in Spaces Used for EnvironmentalAir: **EMT**
8. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: **EMT**
9. Pathways for Concealed General-Purpose Distribution of Optical-Fiber orCommunications Cable: **EMT.**
10. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250, Type 4 **stainless steel** in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: **1/2-inch (16-mm)** trade size. Minimum size for optical-fiber cables is1 inch (27 mm).

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated.Comply with NEMA FB 2.10.
2. EMT: Use: **setscrew or compression**, **steel** fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply withNEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds **120 deg F (49 deg C)**.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569 for installation requirements except whererequirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum

pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot- water pipes. Install horizontal pathway runs above water and steam piping.

C. Comply with requirements in Electrical Specifications..

D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches (300 mm) of changes in direction.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

F. Stub-ups to Above Recessed Ceilings:

1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs orin an enclosure.

G. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

I. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

J. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

K. Spare Pathways: Install pull wires in empty pathways. Cap underground pathways designated asspare above grade alongside pathways in use.

L. Surface Pathways:

1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.

M. Pathways for Optical-Fiber and Communications Cable: Install pathways as follows:

1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50feet (15 m).
2. 1-Inch (27-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet(23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathwayunless Drawings show stricter requirements.

N. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.

O. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigeratedspaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

P. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for **luminaires,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

Q. Mount boxes at heights indicated on Drawings according to ADA requirements. Install boxes with height measured to **center** of box unless otherwise indicated.

R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Electrical Specifications.

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

END OF SECTION 280528

SECTION 28 13 00 - SECURITY MANAGEMENT SYSTEM – ACCESS

CONTROLPART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Security access central-control station.
2. One or more security access networked workstations.
3. Security access operating system and application software.
4. Security access controllers connected to high-speed electronic-data transmission network.

1.2 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for thepurpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Location: A Location on the network having a PC-to-controller communications link, with additional Controllers at the Location connected to the PC-to-controller link with TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. PCI Bus: Peripheral Component Interconnect. A peripheral bus providing a high-speed data path between the CPU and peripheral devices such as monitor, disk drive, or network.

F. RAS: Remote access services.

G. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphicsapplication, such as an image editing program or desktop publishing program, activate a scanner,frame grabber, or other image-capturing device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Comply with SIA BIO-01.

B. Shop Drawings:

1. Diagrams for cable management system.
2. System labeling schedules.
3. Wiring diagrams.
4. Cable administration drawings.
5. Battery and charger calculations for central station, workstations, and controllers.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data include the following:

1. Software documentation.
2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, anddrivers for all installed hardware. Provide separately for each PC.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides,user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setupdecisions.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, bya qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with **SIA DC-01 and** SIA DC-03.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F (16 to 30 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except central-station control unit, installed in **temperature-controlled** indoor environments shall be rated for continuous operation in ambient conditions of **36 to 122 deg F (2 to 50 deg C)** dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, **Type 3R** enclosures. System

componentsinstalled in **non-temperature-controlled** indoor environments shall be rated for

continuous operation in ambient conditions of **0 to 122 deg F (minus 18 to plus 50 deg C)** dry bulb and 20 to 90 percent relative humidity, noncondensing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide web-based rack mounted access control and event monitoring system, provide completewith required hardware, software, and licenses. Due to hardware compatibility requirements for the county, no equal will be accepted.

B. Provide rack mounted intelligent field panel for distributing processes to monitoring system, provide complete with required hardware and software. Due to hardware compatibility requirements for the county, no equal will be accepted.

1. Provide access control appurtenances as indicated in these specifications.

C. Refer to section 282300 for Video Surveillance (CCTV) requirements

2.2 DESCRIPTION

A. Security System shall be installed complete and interfaced under one management platform.

B. System to include the following primary systems:

1. Access Control
2. Camera Surveillance (CCTV)

C. System to interface to the following systems (not limited to):

1. Fire Alarm
2. Email

D. This specification defines requirements within the Security System's management platform (server, PC client, software, etc.) and access control system components.

E. Refer to project plans for equipment schedule.

F. Refer to section 282300 for Video Surveillance (CCTV) requirements.

G. Network(s) connecting PCs and controllers shall consist of one or more of the following:

1. Local area, IEEE 802.3 Fast Ethernet **Gigabit-Ethernet**, star topology network based onTCP/IP.

H. UPS: Self-contained.

1. Size: Provide a minimum of **six** hours of operation of the access control and eventmonitoring system and intelligent field controllers.
2. Batteries: Sealed, valve regulated, recombinant, lead calcium.
3. Accessories:

    a. Transient voltage suppression.
    b. Input-harmonics reduction.
    c. Rectifier/charger.
    d. Battery disconnect device.
    e. Static bypass transfer switch.
    f. Internal maintenance bypass/isolation switch.
    g. External maintenance bypass/isolation switch.
    h. Output isolation transformer.
    i. Remote UPS monitoring.
    j. Battery monitoring.
    k. Remote battery monitoring.

2.3 OPERATION

A. Security access system shall use a single database for access-control and credential-creation functions.

B. Distributed Processing: A fully distributed processing system.

1. Access-control information, including time, date, valid codes, access levels, and similar data, shall be downloaded to controllers so each controller can make access-control decisions.
2. Intermediate controllers for access control are prohibited.
3. In the event that communications with the central controller are lost, controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the central station.

C. System Network Requirements:

1. System components shall be interconnected and shall provide automatic communication ofstatus changes, commands, field-initiated interrupts, and other communications required for proper system operation.
2. Communication shall not require operator initiation or response and shall return to normalafter partial- or total-network interruption such as power loss or transient upset.
3. System shall automatically annunciate communication failures to the operator and shall identify the communications link that has experienced a partial or total failure.
4. Communications controller may be used as an interface between the central-station display systems and the field device network. Communications controller shall provide functions required to attain the specified network communications performance.

D. Central station shall provide operator interface, interaction, display, control, and dynamic and real-time monitoring. Central station shall control system networks to interconnect all system components, including workstations and field-installed controllers.

E. Field equipment shall include controllers, sensors, and controls.

1. Controllers shall serve as an interface between the central station and sensors and controls.
2. Data exchange between the central station and the controllers shall include down-linetransmission of commands, software, and databases to controllers.
3. The up-line data exchange from the controller to the central station shall include status datasuch as intrusion alarms, status reports, and entry-control records.
4. Controllers are classified as alarm-annunciation or entry-control type.

F. System Response to Alarms: Field device network shall provide a system end-to-end responsetime of **one** second(s) or less for every device connected to the system.

G. False-Alarm Reduction: The design of the central station and controllers shall contain features toreduce false alarms. Equipment and software shall comply with SIA CP-01.

H. Error Detection:

1. Use a cyclic code method to detect single- and double-bit errors, burst errors of eight bits or fewer, and at least 99 percent of all other multibit and burst errors between controllers and the central station.
2. Interactive or product error-detection codes alone will not be acceptable.

I. Data Line Supervision: System shall initiate an alarm in response to opening, closing, shorting,or grounding of data transmission lines.

J. Door Hardware Interface:

1. Comply with requirements in architectural Door Hardware specifications for door hardware required to be monitored or controlled by the security management system.
2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.4 APPLICATION SOFTWARE

A. System Software: Based on 64-bit, Microsoft Windows central-station and workstation operatingsystem and application software.

1. Graphical user interface shall show pull-down menus and a menu-tree format.
2. Capability for future additions within the indicated system size limits.
3. Open architecture that allows importing and exporting of data and interfacing with othersystems that are compatible with operating system.
4. Password-protected operator login and access.

B. Application Software: Interface between the alarm annunciation and entry-control controllers tomonitor sensors, operate displays, report alarms, generate reports, and help train system operators.

1. Reside at the central station, workstations, and controllers as required to perform specifiedfunctions.
2. Operate and manage peripheral devices.

3. Manage files for disk I/O, including creating, deleting, and copying files; and automatically maintain a directory of all files, including size and location of each sequential and random-ordered record.
4. Import custom icons into graphics to represent alarms and I/O devices.
5. Globally link I/O so that any I/O can link to any other I/O within the same Location without requiring interaction with the host PC. This operation shall be at the controller.
6. Globally code I/O links so that any access-granted event can link to any I/O with the same Location without requiring interaction with the host PC. This operation shall be at the controller.
7. Messages from PC to controllers and controllers to controllers shall be on a polled network that utilizes check summing and acknowledgment of each message. Communication shall be automatically verified, buffered, and retransmitted if message is not acknowledged.
8. Selectable poll frequency and message time-out settings shall handle bandwidth and latency issues for TCP/IP, RF, and other PC-to-controller communications methods by changing the polling frequency and the amount of time the system waits for a response.
9. Automatic and encrypted backups for database and history backups shall be automatically stored at **the central-control PC** and encrypted with a nine-character alphanumeric password that must be used to restore or read data contained in backup.
10. Operator audit trail for recording and reporting all changes made to database and system software.
11. Support network protocol and topology, TCP/IP, Novel Netware, Digital Pathworks, Banyan Vines, LAN/WAN, and RAS.

C. Workstation Software:

1. Password levels shall be individually customized at each workstation to allow or disallow operator access to program functions for each Location.
2. Workstation event filtering shall allow user to define events and alarms that will be displayed at each workstation. If an alarm is unacknowledged (not handled by another workstation) for a preset amount of time, the alarm will automatically appear on the filtered workstation.

D. Controller Software:

1. Controllers shall operate as autonomous, intelligent processing units.

    a. Controllers shall make decisions about access control, alarm monitoring, linking functions, and door-locking schedules for their operation, independent of other system components.
    b. Controllers shall be part of a fully distributed processing-control network.
    c. The portion of the database associated with a controller, and consisting of parameters, constraints, and the latest value or status of points connected to that controller, shall be maintained in the controller.

2. The following functions shall be fully implemented and operational within each controller:

    a. Monitoring inputs.

b. Controlling outputs.
c. Automatically reporting alarms to the central station.

d. Reporting of sensor and output status to central station on request.
e. Maintaining real time, automatically updated by the central station at least once aday.
f. Communicating with the central station.
g. Executing controller resident programs.
h. Diagnosing.
i. Downloading and uploading data to and from the central station.

3. Controller Operations at a Location:

a. Up to **64** controllers connected to TIA 485-A communications loop. Globally operating I/O linking and anti-passback functions between controllers within the same Location without central-station or workstation intervention. Linking and anti-passback shall remain fully functional within the same Location even when the central station or workstations are off-line.
b. In the event of communication failure between the central station and a Location, there shall be no degradation in operations at the controllers at that Location. Controllers at each Location shall be connected to a memory buffer with a capacity to store up to 10,000 events; there shall be no loss of transactions in system historyfiles until the buffer overflows.
c. Buffered events shall be handled in a first-in-first-out mode of operation.

4. Individual Controller Operation:

a. Controllers shall transmit alarms, status changes, and other data to the central station when communications circuits are operable. If communications are not available, controllers shall function in a stand-alone mode; operational data, including the status and alarm data normally transmitted to the central station, shall be stored for later transmission to the central station. Storage capacity for the latest 1024 events shall be provided at each controller.
b. Controllers shall provide a response to card readers or keypad entries in less than 0.25 seconds, regardless of system size.
c. Controllers that are reset, or powered up from a nonpowered state, shall automatically request a parameter download and reboot to their proper working state. This shall happen without any operator intervention.
d. Initial Startup: When controllers are brought on-line, database parameters shall be automatically downloaded to them. After initial download is completed, only database changes shall be downloaded to each controller.
e. On failure for any reason, controllers shall perform an orderly shutdown and force controller outputs to a predetermined failure-mode state, consistent with the failuremodes shown and the associated control device.
f. After power is restored, following a power failure, startup software shall initiate self-test diagnostic routines, after which controllers shall resume normal operation.
g. After controller failure, if the database and application software are no longer resident, controllers shall not restart but shall remain in the failure mode until repaired. If database and application programs are resident, controllers shall immediately resume operation. If not, software shall be restored automatically fromthe central station.

5. Operating systems shall include a real-time clock function that maintains seconds, minutes, hours, day, date, and month. The real-time clock shall be automatically synchronized with the central station at least once a day to plus or minus 10 seconds. The time synchronization shall be automatic, without operator action and without requiring system shutdown.

E. PC-to-Controller Communications:

1. Central-station or workstation communications shall use the following:

   a. TCP/IP LAN interface cards.

2. TCP/IP, and cable or satellite communications shall be alike in the monitoring or control of system except for the connection that must first be made to a voice-over IP Location.
3. TCP/IP network interface card (NIV) shall have an option to set the poll-frequency and message-response time-out settings.
4. PC-to-controller and controller-to-controller communications (direct or TCP/IP) shall use a polled-communication protocol that checks sum and acknowledges each message. All communications shall be verified and buffered, and retransmitted if not acknowledged.

F. Direct Serial or TCP/IP PC-to-Controller Communications:

1. Communication software on the PC shall supervise the PC-to-controller communications link.
2. Loss of communications to any controller shall result in an alarm at all PCs running the communication software.
3. When communications are restored, all buffered events shall automatically upload to the PC, and any database changes shall be automatically sent to the controller.

G. Controller-to-Controller Communications:

1. TIA 485-A, four-wire, point-to-point, regenerative (repeater) communications network methodology.
2. TIA 485-A communications signal shall be regenerated at each controller.

H. Database Downloads:

1. All data transmissions from PCs to a Location, and between controllers at a Location, shall include a complete database checksum to check the integrity of the transmission. If the data checksum does not match, a full data download shall be automatically retransmitted.
2. If a controller is reset for any reason, it shall automatically request and receive a database download from the PC. The download shall restore data stored at the controller to their normal working state and shall take place with no operator intervention.

I. Operator Interface:

1. Inputs in system shall have two icon representations, one for the normal state and

one forthe abnormal state.

2. When viewing and controlling inputs, displayed icons shall automatically change to theproper icon to display the current system state in real time. Icons shall also display the

input's state, whether armed or bypassed, and if the input is in the armed or bypassed statedue to a time zone or a manual command.

3. Outputs in system shall have two icon representations, one for the secure (locked) state andone for the open (unlocked) state.
4. Icons displaying status of the I/O points shall be constantly updated to show their currentreal-time condition without prompting by the operator.
5. The operator shall be able to scroll the list of I/Os and press the appropriate toolbar button,or right click, to command the system to perform the desired function.
6. Graphic maps or drawings containing inputs, outputs, and override groups shall include thefollowing:

    a. Database to import and store full-color maps or drawings and allow for input, output,and override group icons to be placed on maps.
    b. Maps to provide real-time display animation and allow for control of points assignedto them.
    c. System to allow inputs, outputs, and override groups to be placed on different maps.
    d. Software to allow changing the order or priority in which maps will be displayed.

7. Override Groups Containing I/Os:

    a. System shall incorporate override groups that provide the operator with the statusand control over user-defined "sets" of I/Os with a single icon.
    b. Icon shall change automatically to show the live summary status of points in thatgroup.
    c. Override group icon shall provide a method to manually control or set to time-zonepoints in the group.
    d. Override group icon shall allow the expanding of the group to show icons representing the live status for each point in the group, individual control over eachpoint, and the ability to compress the individual icons back into one summary icon.

8. Schedule Overrides of I/Os and Override Groups:

    a. To accommodate temporary schedule changes that do not fall within the holiday parameters, the operator shall have the ability to override schedules individually foreach input, output, or override group.
    b. Each schedule shall be composed of a minimum of two dates with separate times foreach date.
    c. The first time and date shall be assigned the override state that the point shall advance to when the time and date become current.
    d. The second time and date shall be assigned the state that the point shall return to when the time and date become current.

9. Copy command in database shall allow for like data to be copied and then edited forspecific requirements, to reduce redundant data entry.

J. Operator Access Control:

1. Control operator access to system controls through **three** password-protected operator levels. System operators and managers with appropriate password clearances shall be ableto change operator levels for operators.
2. Three successive attempts by an operator to execute functions beyond their defined level during a 24-hour period shall initiate a software tamper alarm.
3. System shall display the operator's name or initials in the console's first field. System shallprint the operator's name or initials, action, date, and time on the system printer at login and logoff.
4. The password shall not be displayed or printed.
5. Each password shall be definable and assignable for the following:

    a. Selected commands to be usable.
    b. Access to system software.
    c. Access to application software.
    d. Individual zones that are to be accessed.
    e. Access to database.

K. Operator Commands:

1. Command Input: Plain-language words and acronyms shall allow operators to use the system without extensive training or data-processing backgrounds. System prompts shall be a word, a phrase, or an acronym.
2. Command inputs shall be acknowledged, and processing shall start in not less than **one** second(s).
3. Tasks that are executed by operator's commands shall include the following:

    a. Acknowledge Alarms: Used to acknowledge that the operator has observed the alarm message.
    b. Place Zone in Access: Used to remotely disable intrusion-alarm circuits emanating from a specific zone. System shall be structured so that console operator cannot disable tamper circuits.
    c. Place Zone in Secure: Used to remotely activate intrusion-alarm circuits emanatingfrom a specific zone.
    d. System Test: Allows the operator to initiate a system-wide operational test.
    e. Zone Test: Allows the operator to initiate an operational test for a specific zone.
    f. Print reports.
    g. Change Operator: Used for changing operators.
    h. Run system tests.
    i. Generate and format reports.
    j. Request help with the system operation.

        1) Include in main menus.
        2) Provide unique, descriptive, context-sensitive help for selections and functions with the press of one function key.
        3) Provide navigation to specific topic from within the first help window.
        4) Help shall be accessible outside the application program.

    k. Entry-Control Commands:

1) Lock (secure) or unlock (open) each controlled entry and exit up to **four** timesa day through time-zone programming.
2) Arm or disarm each monitored input up to **four** times a day through time-zone programming.
3) Enable or disable readers or keypads up to **two** times a day through time-zoneprogramming.
4) Enable or disable cards or codes up to **four** times a day per entry point throughaccess-level programming.

4. Command Input Errors: Show operator input assistance when a command cannot be executed because of operator input errors. Assistance screen shall use plain-language words and phrases to explain why the command cannot be executed. Error responses that require an operator to look up a code in a manual or other document are not acceptable. Conditions causing operator assistance messages include the following:

a. Command entered is incorrect or incomplete.
b. Operator is restricted from using that command.
c. Command addresses a point that is disabled or out of service.
d. Command addresses a point that does not exist.
e. Command is outside the system's capacity.

L. Alarms:

1. System Setup:

a. Assign manual and automatic responses to incoming-point status change or alarms.
b. Automatically respond to input with a link to other inputs, outputs, or operator- response plans; unique sound with use of WAV files; and maps or images that graphically represent the point location.
c. Sixty-character message field for each alarm.
d. Operator-response-action messages shall allow message length of at least 65,000 characters, with database storage capacity of up to 32,000 messages. Setup shall assign messages to **access point**.
e. Secondary messages shall be assignable by the operator for printing to provide further information and shall be editable by the operator.
f. Allow 25 secondary messages with a field of four lines of 60 characters each.
g. Store the most recent 1000 alarms for recall by the operator using the report generator.

2. Software Tamper:

a. Annunciate a tamper alarm when unauthorized changes to system database files areattempted. Three consecutive unsuccessful attempts to log onto system shall generate a software tamper alarm.
b. Annunciate a software tamper alarm when an operator or other individual makes three consecutive unsuccessful attempts to invoke functions beyond theirauthorization level.

c. Maintain a transcript file of the last 5000 commands entered at each central station to serve as an audit trail. System shall not allow write access to system transcript files by any person, regardless of their authorization level.
d. Allow only acknowledgment of software tamper alarms.

3. Read access to system transcript files shall be reserved for operators with the highest password authorization level available in system.
4. Animated Response Graphics: Highlight alarms with flashing icons on graphic maps; display and constantly update the current status of alarm inputs and outputs in real time through animated icons.
5. Alarm Handling: Each input may be configured so that an alarm cannot be cleared unless it has returned to normal, with options of requiring the operator to enter a comment about disposition of alarm. Allow operator to silence alarm sound when alarm is acknowledged.

M. Alarm Monitoring: Monitor sensors, controllers, and DTS circuits and notify operators of an alarm condition. Display higher-priority alarms first and, within alarm priorities, display the oldest unacknowledged alarm first. Operator acknowledgment of one alarm shall not be considered acknowledgment of other alarms nor shall it inhibit reporting of subsequent alarms.

1. Displayed alarm data shall include type of alarm, location of alarm, and secondary alarmmessages.
2. Printed alarm data shall include type of alarm, location of alarm, date and time (to nearestsecond) of occurrence, and operator responses.
3. Maps shall automatically display the alarm condition for each input assigned to that mapif that option is selected for that input location.
4. Alarms initiate a status of "pending" and require the following two handling steps byoperators:

a. First Operator Step: "Acknowledged." This action shall silence sounds associated with the alarm. The alarm remains in the system "Acknowledged" but "Un- Resolved."
b. Second Operator Step: Operators enter the resolution or operator comment, giving the disposition of the alarm event. The alarm shall then clear.

5. Each alarm point shall be programmable to disallow the resolution of alarms until the alarmpoint has returned to its normal state.
6. Alarms shall transmit to central station in real time.
7. Alarms shall be displayed and managed from a minimum of four different windows.

a. Input Status Window: Overlay status icon with a large red blinking icon. Selecting the icon will acknowledge the alarm.
b. History Log Transaction Window: Display name, time, and date in red text. Selecting red text will acknowledge the alarm.
c. Alarm Log Transaction Window: Display name, time, and date in red. Selecting redtext will acknowledge the alarm.
d. Graphic Map Display: Display a steady colored icon representing each alarm input location. Change icon to flashing red when the alarm occurs. Change icon from flashing red to steady red when the alarm is acknowledged.

8. Once an alarm is acknowledged, the operator shall be prompted to enter comments about the nature of the alarm and actions taken. Operator's comments may be manually entered or selected from a programmed predefined list, or a combination of both.
9. For locations where there are regular alarm occurrences, provide programmed comments. Selecting that comment shall clear the alarm.
10. The time and name of the operator who acknowledged and resolved the alarm shall be recorded in the database.
11. Identical alarms from the same alarm point shall be acknowledged at the same time the operator acknowledges the first alarm. Identical alarms shall be resolved when the first alarm is resolved.
12. Alarm functions shall have priority over downloading, retrieving, and updating database from workstations and controllers.
13. When a reader-controlled output (relay) is opened, the corresponding alarm point shall be automatically bypassed.

N. Monitor Display: Display text and graphic maps that include zone status integrated into the display. Colors are used for the various components and current data. Colors shall be uniform throughout the system.

1. Color Code:

a. FLASHING RED: Alerts operator that a zone has gone into an alarm or that primary power has failed.
b. STEADY RED: Alerts operator that a zone is in alarm and alarm has been acknowledged.
c. YELLOW: Advises operator that a zone is in access.
d. GREEN: Indicates that a zone is secure and that power is on.

2. Graphics:

a. Support 32,000 graphic display maps and allow import of maps from a minimum of 16 standard formats from another drawing or graphics program.
b. Allow I/O to be placed on graphic maps by the drag-and-drop method.
c. Operators shall be able to view the inputs, outputs, and the point's name by moving the mouse cursor over the point on graphic map.
d. Inputs or outputs may be placed on multiple graphic maps. The operator shall be able to toggle to view graphic map associated with I/Os.
e. Each graphic map shall have a display-order sequence number associated with it to provide a predetermined order when toggled to different views.
f. Camera icons shall have the ability to be placed on graphic maps that, when selected by an operator, will open a video window, display the camera associated with that icon, and provide pan-tilt-zoom control.
g. Input, output, or camera placed on a map shall allow the ability to arm or bypass an input, open or secure an output, or control the pan-tilt-zoom function of the selected camera.

O. System test software enables operators to initiate a test of the entire system or of a particular portion of the system.

1. Test Report: The results of each test shall be stored for future display or printout. The reportshall document the operational status of system components.

P. Report Generator Software: Include commands to generate reports for displaying, printing, and storing on disk and tape. Reports shall be stored by type, date, and time. Report printing shall bethe lowest-priority activity. Report-generation mode shall be operator selectable but set up initially as periodic, automatic, or on request. Include time and date printed and the name of operator generating the report. Report formats may be configured by operators.

1. Automatic Printing: Setup shall specify, modify, or inhibit the report to be generated; the time the initial report is to be generated; the time interval between reports; the end of period; and the default printer.
2. Printing on Request: An operator may request a printout of any report.
3. Alarm Reports: Reporting shall be automatic as initially set up. Include alarms recorded bysystem over the selected time and information about the type of alarm **(such as door alarm,intrusion alarm, tamper alarm, etc.)**, the type of sensor, the location, the time, and the action taken.
4. Access and Secure Reports: Document zones placed in access, the time placed in access, and the time placed in secure mode.
5. Custom Reports: Reports tailored to exact requirements of who, what, when, and where. As an option, custom report formats may be stored for future printing.
6. Automatic History Reports: Named, saved, and scheduled for automatic generation.
7. Cardholder Reports: Include data, or selected parts of the data, as well as the ability to be sorted by name, card number, imprinted number, or by any of the user-defined fields.
8. Cardholder by Reader Reports: Based on who has access to a specific reader or group of readers by selecting the readers from a list.
9. Cardholder by Access-Level Reports: Display everyone that has been assigned to the specified access level.
10. Panel Labels Reports: Printout of control-panel field documentation including the actual location of equipment, programming parameters, and wiring identification. Maintainsystem installation data within system database so that they are available on-site at all times.
11. History Reports: Custom reports that allows the operator to select any date, time, event type, device, output, input, operator, Location, name, or cardholder to be included or excluded from the report.

    a. Initially store history on the hard disk of the host PC.
    b. Permit viewing of the history on workstations or print history to any system printer.
    c. The report shall be definable by a range of dates and times with the ability to have adaily start and stop time over a given date range.
    d. Each report shall depict the date, time, event type, event description, and device; orI/O name, cardholder group assignment, and cardholder name or code number.
    e. Each line of a printed report shall be numbered to ensure that the integrity of the report has not been compromised.
    f. Total number of lines of the report shall be given at the end of the report. If the reportis run for a single event such as "Alarms," the total shall reflect how many alarms occurred during that period.

12. Reports shall have the following four options:

a. View on screen.
b. Print to system printer. Include automatic print spooling and "Print To" options ifmore than one printer is connected to system.
c. "Save to File" with full path statement.
d. System shall have the ability to produce a report indicating status of system inputs and outputs or of inputs and outputs that are abnormal, out of time zone, manually overridden, not reporting, or in alarm.

13. Custom Code List Subroutine: Allow the access codes of system to be sorted and printed according to the following criteria:

a. Active, inactive, or future activate or deactivate.
b. Code number, name, or imprinted card number.
c. Group, Location, access levels.
d. Start and stop code range.
e. Codes that have not been used since a selectable number of days.
f. In, out, or either status.
g. Codes with trace designation.

14. The reports of system database shall allow options so that every data field may be printed.
15. The reports of system database shall be constructed so that the actual position of the printed data shall closely match the position of the data on the data-entry windows.

Q. Visitor Assignment:

1. Provide for and allow an operator to be restricted to only working with visitors. The visitorbadging subsystem shall assign credentials and enroll visitors. Allow only those access levels that have been designated as approved for visitors.
2. Provide an automated log of visitor name, time and doors accessed, and name of person contacted.
3. Allow a visitor designation to be assigned to a credential holder.
4. Security access system shall be able to restrict the access levels that may be assigned tocredentials issued to visitors.
5. Allow operator to recall visitors' credential-holder file, once a visitor is enrolled in thesystem.
6. The operator may designate any reader as one that deactivates the credential after use atthat reader. The history log shall show the return of the credential.
7. System shall have the ability to use the visitor designation in searches and reports. Reportsshall be able to print all or any visitor activity.

R. Training Software: Enables operators to practice system operation including alarm acknowledgment, alarm assessment, response force deployment, and response force communications. System shall continue normal operation during training exercises and shall terminate exercises when an alarm signal is received at the console.

S. Entry-Control Enrollment Software: Database management functions that allow operators to add,delete, and modify access data as needed.

1. The enrollment station shall not have alarm response or acknowledgment functions.

2. Provide multiple, password-protected access levels. Database management and modification functions shall require a higher operator access level than personnel enrollment functions.
3. The program shall provide means to disable the enrollment station when it is unattended, to prevent unauthorized use.
4. The program shall provide a method to enter personnel identifying information into the entry-control database files through enrollment stations. In the case of personnel identity- verification subsystems, this shall include biometric data. Allow entry of personnel identifying information into the system database using menu selections and data fields. Thedata field names shall be customized during setup to suit user and site needs. Personnel identity-verification subsystems selected for use with the system shall fully support the enrollment function and shall be compatible with the entry-control database files.
5. Cardholder Data: Provide 99 user-defined fields. System shall have the ability to run searches and reports using any combination of these fields. Each user-defined field shall be configurable, using any combination of the following features:

    a. MASK: Determines a specific format with which data must comply.
    b. REQUIRED: Operator is required to enter data into field before saving.
    c. UNIQUE: Data entered must be unique.
    d. DEACTIVATE DATE: Data entered will be evaluated as an additional deactivatedate for all cards assigned to this cardholder.
    e. NAME ID: Data entered will be considered a unique ID for the cardholder.

6. Personnel Search Engine: A report generator with capabilities such as search by last name, first name, group, or any predetermined user-defined data field; by codes not used in definable number of days; by skills; or by seven other methods.
7. Multiple Deactivate Dates for Cards: User-defined fields to be configured as additional stop dates to deactivate any cards assigned to the cardholder.
8. Batch card printing.
9. Default card data can be programmed to speed data entry for sites where most card data are similar.
10. Enhanced ACSII File Import Utility: Allows the importing of cardholder data and images.
11. Card Expire Function: Allows readers to be configured to deactivate cards when a card is used at selected devices

2.5 SYSTEM DATABASE

A. Database and database management software shall define and modify each point in database usingoperator commands. Definition shall include parameters and constraints associated with each system device.

B. Database Operations:

1. System data management shall be in a hierarchical menu-tree format, with navigation through expandable menu branches and manipulated with use of menus and icons in a mainmenu and system toolbar.
2. Navigational Aids:

a. Toolbar icons for add, delete, copy, print, capture image, activate, deactivate, andmuster report.
b. Point and click feature to facilitate data manipulation.
c. Next and previous command buttons visible when editing database fields to facilitatenavigation from one record to the next.
d. Copy command and copy tool in the toolbar to copy data from one record to createa new similar record.

3. Data entry shall be automatically checked for duplicate and illegal data and shall be verifiedfor valid format.
4. System shall generate a memo or note field for each item that is stored in database, allowingthe storing of information about any defining characteristics of the item. Memo field is used for noting the purpose for which the item was entered, reasons for changes that weremade, and the like.

C. File Management:

1. File management shall include database backup and restoration system, allowing selectionof storage media, including 3.5-inch floppy disk, Zip and Jaz drives, and designated network resources.
2. Operations shall be both manual and automatic modes. The number of automatic sequentialbackups before the oldest backup becomes overwritten; FIFO mode shall be operator selectable.
3. Backup program shall provide manual operation from any PC on the LAN and shall operatewhile system remains operational.

D. Operator Passwords:

1. Support up to **32,000** individual system operators, each with a unique password.
2. **One to eight alphanumeric characters**.
3. Allow passwords to be case sensitive.
4. Passwords shall not be displayed when entered.
5. Passwords shall have unique and customizable password profile, and allow several operators to share a password profile. Include the following features in the password profile:

a. Predetermine the highest-level password profile for access to all functions and areasof program.
b. Allow or disallow operator access to any program operation, including the functionsof View, Add, Edit, and Delete.
c. Restrict doors to which an operator can assign access.

6. Operators shall use a user name and password to log on to system. This user name and password shall be used to access database areas and programs as determined by the associated profile.
7. Make provision to allow the operator to log off without fully exiting program. User may be logged off but program will remain running while displaying the login window for the next operator.

E. Security Access Integration:

1. Photo ID badging and photo verification shall use the same database as the security accessand may query data from cardholder, group, and other personal information to build a custom ID badge.
2. Automatic or manual image recall and manual access based on photo verification shall alsobe a means of access verification and entry.
3. System shall allow sorting of cardholders together by group or other characteristic for a fast and efficient method of reporting on, and enabling or disabling, cards or codes.

F. Operator Comments:

1. With the press of one appropriate button on the toolbar, the user shall be permitted to enteroperator comments into the history at anytime.
2. Automatic prompting of operator comment shall occur before the resolution of each alarm.
3. Operator comments shall be recorded by time, date, and operator number.
4. Comments shall be sorted and viewed through reports and history.
5. The operator may enter comments in two ways; either or both may be used:

    a. Manually entered through keyboard data entry (typed), up to 65,000 characters pereach alarm.
    b. Predefined and stored in database for retrieval on request.

6. System shall have a minimum of 999 predefined operator comments with up to 30characters per comment.

G. Group:

1. Group names may be used to sort cardholders into groups that allow the operator to determine the tenant, vendor, contractor, department, division, or any other designation ofa group to which the person belongs.
2. System software shall have the capacity to assign one of 32,000 group names to an accessauthorization.
3. Make provision in software to deactivate and reactivate all access authorizations assignedto a particular group.
4. Allow sorting of history reports and code list printouts by group name.

H. Time Zones:

1. Each zone consists of a start and stop time for seven days of the week and three holiday schedules. A time zone is assigned to inputs, outputs, or access levels to determine when an input shall automatically arm or disarm, when an output automatically opens or secures, or when access authorization assigned to an access level will be denied or granted.
2. Up to four time zones may be assigned to inputs and outputs to allow up to four arm or disarm periods per day or four lock or unlock periods per day; up to three holiday overrideschedules may be assigned to a time zone.
3. Data-entry window shall display a dynamically linked bar graph showing active and inactive times for each day and holiday, as start and stop times are entered or edited.

4. System shall have the capacity for **2048** time zones for each location.

I. Holidays:

1. Three different holiday schedules may be assigned to a time zone. Holiday schedule consists of date in format MM/DD/YYYY and a description. When the holiday date matches the current date of the time zone, the holiday schedule replaces the time-zone schedule for that 24-hour period.
2. System shall have the capacity for **32,000** holidays.
3. Three separate holiday schedules may be applied to a time zone.
4. Holidays have an option to be designated as occurring on the designated date each year. These holidays remain in system and will not be purged.
5. Holidays not designated to occur each year shall be automatically purged from the databaseafter the date expires.

J. Access Levels:

1. System shall allow for the creation of **unlimited** access levels.
2. One level shall be predefined as the Master Access Level. The Master Access Level shall work at all doors at all times.
3. System shall allow for access to be restricted to any area by reader and by time. Access levels shall determine when and where an Identifier is authorized.
4. System shall be able to create multiple door and time-zone combinations under the same access level so that an Identifier may be valid during different time periods at different readers even if the readers are on the same controller.

K. User-Defined Fields:

1. System shall provide a minimum of 99 user-defined fields, each with up to 50 characters, for specific information about each credential holder.
2. System shall accommodate a title for each field; field length shall be 20 characters.
3. A "Required" option may be applied to each user-defined field that, when selected, forcesthe operator to enter data in the user-defined field before the credential can be saved.
4. A "Unique" option may be applied to each user-defined field that, when selected, will notallow duplicate data from different credential holders to be entered.
5. Data format option may be assigned to each user-defined field that will require the data tobe entered with certain character types in specific spots in the field entry window.
6. A user-defined field, if selected, will define the field as a deactivate date. The selection shall automatically cause the data to be formatted with the windows MM/DD/YYYY dateformat. The credential of the holder will be deactivated on that date.
7. A search function shall allow any one user-defined field or combination of user-defined fields to be searched to find the appropriate cardholder. The search function shall include search for a character string.
8. System shall have the ability to print cardholders based on and organized by the user- defined fields.

2.6 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarmsand indicate locations.

2.7 WORK STATION HARDWARE

A. Work Station Computer: Desktop Tower; provide minimum hardware as required by specified manufacturer.

1. Memory: 16 GB of usable installed memory, expandable to a minimum of 32 GB withoutadditional chassis or power supplies.
2. Central Processor Unit (CPU): Intel Core I7-8700.
3. Power Supply: Minimum capacity of 265W.
4. Real-Time Clock:

    a. Accuracy: Plus or minus one minute per month.
    b. Time-Keeping Format: 24-hour time format including seconds, minutes, hours, date,day, and month; resettable by software.
    c. Clock shall function for one year without power.
    d. Provide automatic time correction once every 24 hours by synchronizing clock withthe Time Service Department of the U.S. Naval Observatory.

5. LAN Adapter Card: **10/100/1000** Mbps PCI bus, internal network interface card.
6. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
7. Graphics Card: For 6 output video distribution – 12.29 TFLOPS single precision performance, 16GB HBM2 vRAM, PCI-E x 16 interface; equal to AMD Radeon Pro WX9100.
8. Color Monitor: Not less than **22 inches diagonal**, with a minimum resolution of **1920 by 1080** pixels.
9. Keyboard: With a minimum of 64 characters, standard ASCII character set based on ANSI INCITS 154.
10. Mouse: Standard, compatible with the installed software.
11. Special-function keyboard attachments or special-function keys to facilitate data input ofthe following operator tasks:

    a. Help.
    b. Alarm Acknowledge.
    c. Place Zone in Access.
    d. Place Zone in Secure.
    e. System Test.

f. Print Reports.
g. Change Operator.

12. Disk storage shall include the following, each with appropriate controller:

a. Minimum **1** TB SSD primary and 1 TB 7200 RPM HDD secondary.
b. Audible Alarm: Manufacturer's standard.
c. 8x +/- DVD-RW Drive

13. Report Printer:

a. Connected to the central station and designated workstations.
b. Interface: Bidirectional parallel, and universal serial bus.
c. LAN Adapter Card: **10/100/1000** Mbps internal network interface card.

B. UPS: Self-contained.

1. Size: Provide a minimum of **six** hours of operation of the work-station equipment, including two hours of alarm printer operation.
2. Batteries: Sealed, valve regulated, recombinant, lead calcium.
3. Accessories:

a. Transient voltage suppression.
b. Input-harmonics reduction.
c. Rectifier/charger.
d. Battery disconnect device.
e. Static bypass transfer switch.
f. Internal maintenance bypass/isolation switch.
g. External maintenance bypass/isolation switch.
h. Output isolation transformer.
i. Remote UPS monitoring.
j. Battery monitoring.
k. Remote battery monitoring.

2.8 CONTROLLERS

A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the central station or workstation for controlling its operation.

B. Subject to compliance with requirements in this article, manufacturers may use multipurpose controllers.

C. Battery Backup: Sealed, lead acid; sized to provide run time during a power outage of 90 minutes,complying with UL 924.

D. Alarm Annunciation Controller:

1. The controller shall automatically restore communication within 10 seconds after an interruption with the field device network**, with dc line supervision on each of its alarminputs**.

2. Auxiliary Equipment Power: A GFI service outlet inside the controller enclosure.

E. Entry-Control Controller:

1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.

   a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.
   b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:

      1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted asprivileges.
      2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.

   c. Maintain a date-, time-, and Location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

2. Inputs:

   a. Data from entry-control devices; use this input to change modes between access andsecure.
   b. Database downloads and updates from the central station that include enrollment and privilege information.

3. Outputs:

   a. Indicate success or failure of attempts to use entry-control devices and make comparisons of presented information with stored identification information.
   b. Grant or deny entry by sending control signals to portal-control devices.
   c. Maintain a date-, time-, and Location-stamped record of each transaction andtransmit transaction records to the central station.
   d. Door Prop Alarm: If a portal is held open for longer than **20 seconds**, alarm sounds.

4. With power supplies sufficient to power at voltage and frequency required for field devicesand portal-control devices.

5. when data transmission is degraded and generating continuous checksum errors, the controller shall continue to control entry by accepting identifying information, making authentication decisions, checking privileges, and controlling portal-control devices.

2.9 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Card-Reader Power: Powered from its associated controller, including its standby power source,and shall not dissipate more than 5 W.

B. Response Time: Card reader shall respond to passage requests by generating a signal that is sentto the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.

C. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting typesshall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operatingtemperature range as needed for operation at the site.

D. Display: Digital visual indicator shall provide visual status indications and user prompts. Indicatepower on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

E. Touch-Plate and Proximity Readers:

1. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction and shall receive and decode a unique identification code number transmitted from the credential card.
2. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique identification code number.
3. The card reader shall read proximity cards in a range from contact to at least 6 inches (150mm) from the reader.

2.10 CABLES

A. General Cable Requirements: Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security" and as recommended by system manufacturer for integration requirement.

B. PVC-Jacketed, TIA 485-A Cables: Two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.

C. Plenum-Type, TIA 485-A Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene- propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

D. Multiconductor, PVC, Reader and Wiegand Keypad Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

E. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

F. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

G. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene- propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

H. Multiconductor, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated- ethylene-propylene insulation, overall aluminumfoil/polyester-tape shield with 100 percentshield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.

3. Flame Resistance: NFPA 262 flame test.

I. Paired, Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

J. Paired, Plenum-Type, Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

K. Paired, Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

L. Paired, Plenum-Type, Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated- ethylene-propylene insulation, unshielded, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

M. Paired, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum-foil/polyester-tape shield with No. 22 AWG, stranded (7x30)tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMR.
3. Flame Resistance: UL 1666 riser flame test.

N. Paired, Plenum-Type, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated- ethylene-propylene insulation, aluminum-foil/polyester-tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

O. Paired, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.

2. NFPA 70, Type CMG.

P. Paired, Plenum-Type, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

Q. LAN Cabling:

1. Comply with requirements in Section 280513 "Conductors and Cables for ElectronicSafety and Security."
2. NFPA 262.

2.11 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

2.12 CABLE AND ASSET MANAGEMENT SOFTWARE

A. Computer-based cable and asset management system, with fully integrated database and graphiccapabilities, complying with requirements in TIA/EIA 606-A.

1. Document physical characteristics by recording the network, asset, user, TIA/EAI details, device configurations, and exact connections between equipment and cabling.

a. Manage the physical layer of security system.
b. List device configurations.
c. List and display circuit connections.
d. Record firestopping data.
e. Record grounding and bonding connections and test data.

2. Information shall be presented in database view, schematic plans, or technical drawings.

a. Microsoft Visio Technical Drawing shall be used as drawing and schematic plans software. Drawing symbols, system layout, and design shall comply with SIA/IAPSC AG-01.

3. System shall interface with the following testing and recording devices:

a. Direct-upload tests from circuit testing instrument into the PC.
b. Direct-download circuit labeling into labeling printer.

B. Software shall be designed for of the same version as security access system's central station andworkstations and shall be installed on the designated PC, using a hard drive dedicated only to thismanagement function. Hard-drive capacity shall be not less than **50** GB.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels fordoors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from constructiondocuments. Include system schematics and Visio Technical Drawings in electronic format.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.2 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks,and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks,and counters and except in accessible ceiling spaces and in gypsum board

partitions where

unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

E. Install LAN cables using techniques, practices, and methods that are consistent with Category 5Erating of components and fiber-optic rating of components, and that ensure Category 6 and fiber-optic performance of completed and linked signal paths, end to end.

F. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling levelin occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

G. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.3 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways andSpaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. (1220 m).

D. Card Readers and Keypads:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft. (75 m), and install No. 20 AWGwire if maximum distance is 500 ft. (150 m).
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

E. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed **250 ft. (75 m)**.

F. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of **25 ft. (8 m)**.

3.4 GROUNDING

A. Comply with Section 280526 "Grounding and Bonding for Electronic Safety and Security."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power systemand equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.5 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in TIA/EIA 606-B.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals towhich it connects with the same designation. Use logical and systematic designations for facility'sarchitectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.6 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform databases tests for the completeand proper operation of systems involved. Assign software license to Owner.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assistin testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-B.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-B.1.
2. Test each circuit and component of each system. Tests shall include, but are not limited to,measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated batteryoperating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.9 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with anactivated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in theemploy of Contractor is not present.

3.10 DEMONSTRATION

A. **Train** Owner's maintenance personnel to adjust, operate, and maintain security access system.

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databasesand to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstationsand to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

END OF SECTION 281300

SECTION 28 23 00 - VIDEO

SURVEILLANCEPART 1 - GENERAL

1.1 SUMMARY

A. Section includes a video surveillance system consisting of cameras, digital video recorder, datatransmission wiring, and a control station with its associated equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features,performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, andattachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances,method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components forsignal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Showaccess and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serialnumber, location, and date of original installation.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, bya qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance and access-control systems shall comply with SIA TVAC.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F (16 to 29 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in **temperature-controlled** interior environments shall be rated for continuous operation in ambient temperatures of **36 to 122 deg F (2 to 50 deg C)** dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-**temperature- controlled** interior environments shall be rated for continuous operation in ambienttemperatures of **0 to 122 deg F (minus 18 to plus 50 deg C)** dry bulb and 20 to 90 percentrelative humidity, noncondensing. Use NEMA 250, **Type 3R** enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shallbe rated for continuous operation in ambient temperatures of **minus 30 to plus 122 deg F(minus 34 to plus 50 deg C)** dry bulb and 20 to 90 percent relative humidity, condensing.Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph (137 km/h. Use NEMA 250, **Type 3R** enclosures.
5. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replacecomponents of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Three** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Provide all video surveillance system appurtenances as required to ensure a fully-turnkey system.

B. Surge Protection: Protect components from voltage surges entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressorscomplying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low- Voltage Electrical Power Circuits" as recommended by manufacturer for type of line beingprotected.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarmsand indicate locations.

2. STANDARD CAMERAS
2

A. Refer to Drawings for required cameras. Provide all required lenses, mounting hardware, and PoElong span injectors.

2. NETWORK VIDEO MANAGEMENT SYSTEM
3

A. Not required.

2. NETWORK VIDEO RECORDERS
4

A. Not required.

PART 3 - EXECUTION

3.1 WIRING

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways unless otherwise indicated.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271300 "Communications Backbone Cabling" and Section 271500 "Communications Horizontal Cabling."

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

B. Set pan-and-tilt unit stops to suit final camera position and to obtain the field of view required forcamera. Connect all controls and alarms, and adjust.

C. Identify system components, wiring, cabling, and terminals according to Section 260553"Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assistin testing.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verifythat they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Verify operation of auto-iris lenses.
    b. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    c. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    d. Set and name all preset positions; consult Owner's personnel.
    e. Set sensitivity of motion detection.
    f. Connect and verify responses to alarms.
    g. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and systemhas been in normal functional operation for at least 14 days. Provide a minimum of 10 days'notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. **Train** Owner's maintenance personnel to adjust, operate, and maintain video-surveillanceequipment.

END OF SECTION 282300

SECTION 31 31 16 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment with termiticide..

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the EPA-Registered Label for termiticide products.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Soil Treatment Application Report: Include the following:

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

C. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.

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

1.5 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.

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

1.6 WARRANTY

A. Soil Treatment 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: **Three** years from date of Substantial Completion.

1.7 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, terms for agreement period, and terms for future renewal options.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: Provide an Registered termiticide, complying with requirements of authorities having jurisdiction, including the FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES in compliance with Florida Statues, Chapter 487, 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.

1. Products: **As listed on the Florida Department of Agriculture and Consumer Services website.**

http://www.flaes.org/pdf/termiticidesregisteredinflorida.pdf

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than **three** years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

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

3.2 APPLYING SOIL TREATMENT

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

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

C. 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.

D. 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: Underground-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; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Masonry: Treat voids.
4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

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

F. 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.

G. Post warning signs in areas of application.

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

END OF SECTION 31 31 16